American Machinist

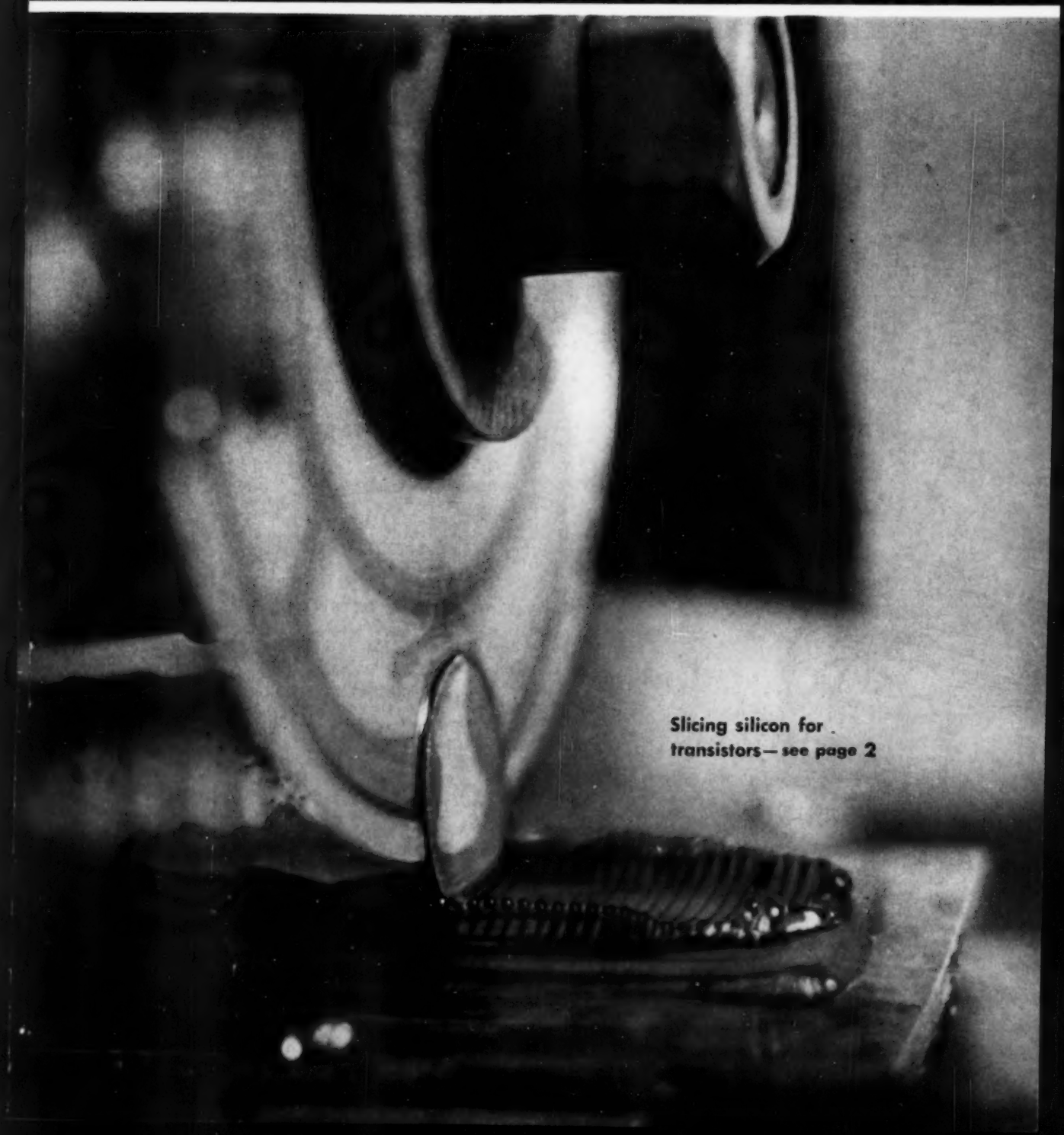
SEPTEMBER 8, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Fastening Devices

A SPECIAL REPORT

Page 97



Slicing silicon for transistors—see page 2

it's mainly a matter of TIMING!

When you replace a machine at the RIGHT TIME, it's the most profitable investment you can make

WHAT is the retirement age of a machine tool? Unfortunately, there's only one answer — "It depends." And it depends on so many things that there's a temptation to by-pass the precise computations and use some general approximations or rule-of-thumb estimates.

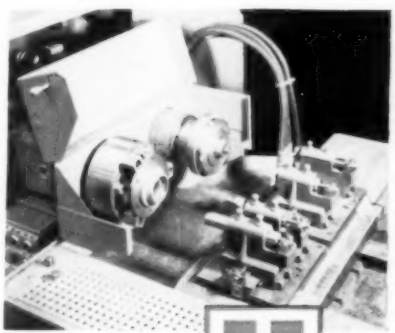
The temptation can be *costly*. For there's only one *right time* to replace a machine. A time when production cost, payoff time and carrying charges will result in the minimum net investment for your company. Too early is as bad as too late. Either way, you lose money.

If you are looking for ways to improve the profit picture, now is the time to take a good look at your replacement schedule. If the time is right, an investment in a new machine will yield a bigger return than any other investment you can make.

Heald engineers are well experienced in making obsolescence studies. And their specialized know-how in this field is available to you at any time — to help you save money by a properly timed replacement program. Similar studies by Heald engineers have pointed the way to many important cost savings.

For example: A manufacturer of centrifugal pumps had been using a Model 48A Heald Bore-Matic (1946 vintage) to bore, turn and face miscellaneous pump parts. Could it be "retired" at a *profit?* To answer the question, a cost analysis was made, in comparison with a new Heald Model 321 Bore-Matic. Based on the figures shown below, the replacement *was* made — and at a saving of $6,335 a year!

	Old Machine	New Machine
Direct and Indirect Labor, per year	$21,550	$17,230
Scrap Losses	1,803	263
Annual Maintenance	695	220
Annual Operating Cost	$24,048	$17,713
Annual Saving for New Machine		$ 6,335



YOU pay for obsolescence. Replacement pays for itself!

THE HEALD MACHINE COMPANY

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Hydraulic tracers convert planers into contour mills . . . Hydraulic cylinders replace rack-and-gear drives in this economical modernization. *By William N Engel, H & B American Machine Co.*..... **122**

SPECIAL REPORT NUMBER 464

The production man's guide to fastening devices . . . a comprehensive summary of the many types of standard and special fasteners. *By John J Dwyer, Jr.* **97**

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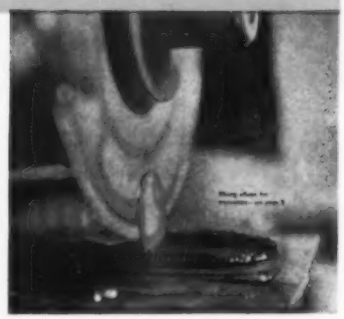
American Machinist chips



Precision slice . . . When germanium or silicon crystals are cut for transistors, the metal must be oriented so the cut is made in the proper relationship to crystal planes. At Bell Telephone Laboratories, where the transistor was developed ten years ago, the methods for slicing and dicing these metals are based on years of experience. For the story of how they do it at Bell Labs see the story on page 85.

Fasteners . . . Probably the major cause of product failures stems from assembly, often from use of the wrong mechanical fastening device. All production men know scores of devices but may not recall the specific device they used at a given time. To aid you, Assistant Editor Jack Dwyer has assembled concise information on both standard and special fasteners in the report on page 97.

Commercial tape . . . There is a tendency to classify numerical control as a rather expensive way to produce your product, perhaps necessary in special cases and fine when Uncle Sam pays the bills. Now Goss Printing Press is proving that tape control of positioning makes commercial sense. In not one, but several, applications Goss is cutting cycle time for drilling from 30 to 50%. The facts will be found on page 93.

Fateful omission . . . The crowning embarrassment in publishing is the typographical error that is made when you are correcting another typographical error. The classic case was the newspaper that intended to refer to the town's leading citizen as battle-scarred, but called him bottle-scarred, then corrected it to battle-scared. In the lead article in the July 14 issue, we were embarrassed to have the word "hours" omitted when a correction was being made elsewhere in the title as the page went to press. What we intended to say was that at Raytheon "extrusion cuts time from 3½ hours to 1½ minutes."

Coming . . . *AM* for Sept 22 will offer a Special Report on the cutting of large gears, and articles on noise reduction, simplified drafting, automating equipment, wheel selection for grinding, and other subjects.

Cover . . .

Silicon is sliced at Bell Laboratories for a transistor on a modified bench grinder with a diamond wheel. Details at left.

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ABC

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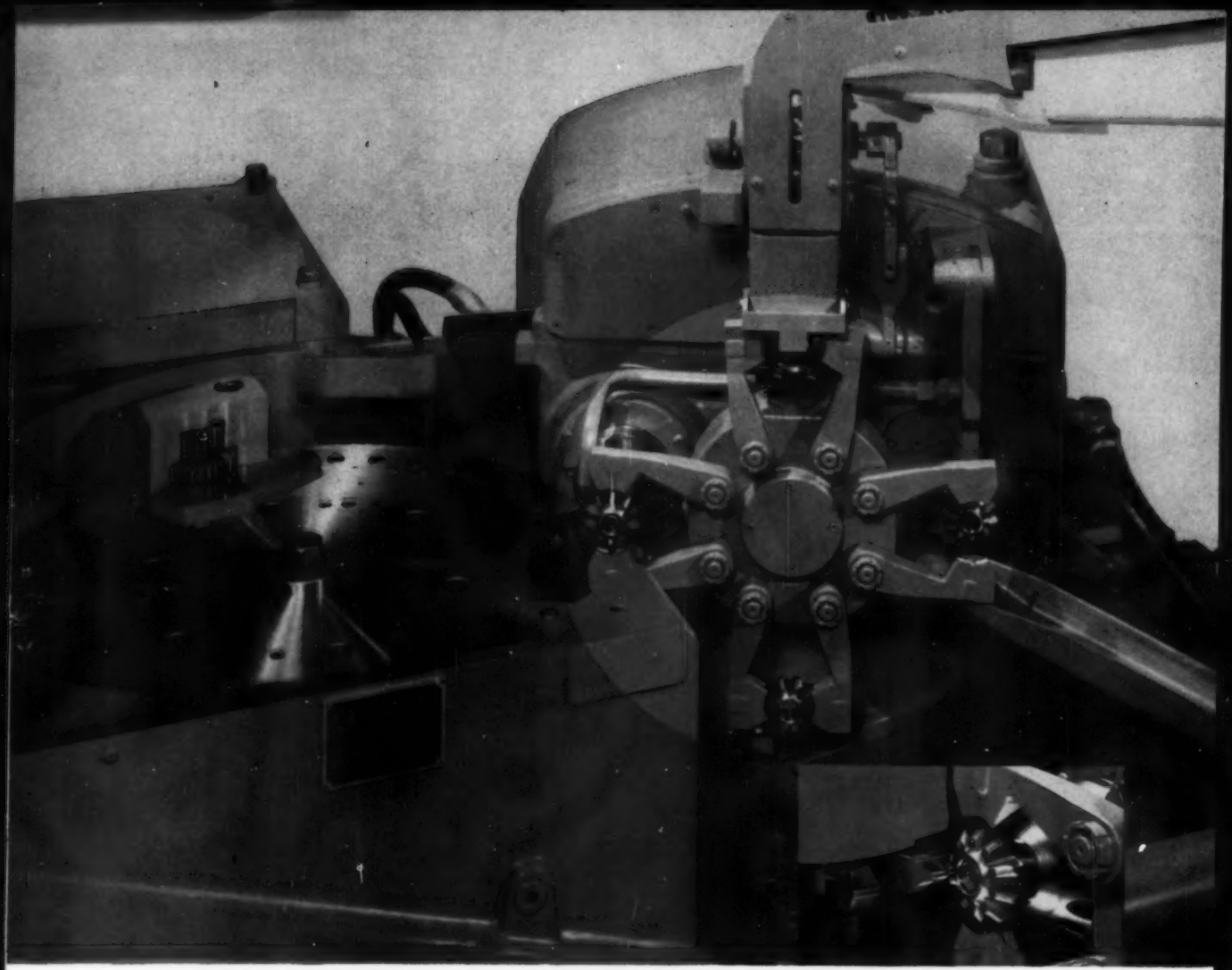


In Revacycle Method each blade of cutter is longer than its predecessor; there is no depthwise feed of cutter itself. One rotation of the cutter completes each tooth from the solid.

Fastest way yet to cut straight bevel gears

If you're looking for a faster, fully automatic way to cut straight bevel gears and pinions with conjugate surfaces and localized tooth bearings, consider the Gleason No. 109 Straight Bevel Revacycle® Machine.

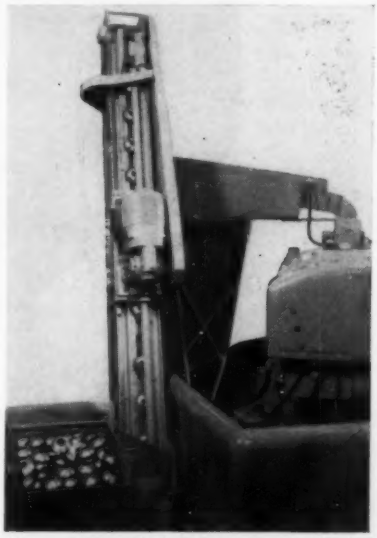
You rough, semifinish, and finish a gear from the solid blank with a single rotation of the Revacycle cutter.

Now both 21″ and 25″ diameter cutters can be used on the No. 109 Revacycle Machine. The 25″ cutter cuts gears to a maximum depth of 0.600″. The 21″ cutter will cut to a maximum of 0.400″.

A new, completely automatic mechanism loads and unloads each gear. You can feed this loader manually or with a conventional belt conveyer.

The No. 109 Machine handles a wide range of automotive and farm machinery gears: up to 10″ diameter, 5:1 ratio, 1¼″ face width.

Send for our bulletin for information on both the machine and the Revacycle Method.



Storage unit and flight conveyer can be fed manually or with belt conveyer. Even with manual operation, one operator can handle a battery of machines.

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Builders of bevel gear machinery for over 90 years

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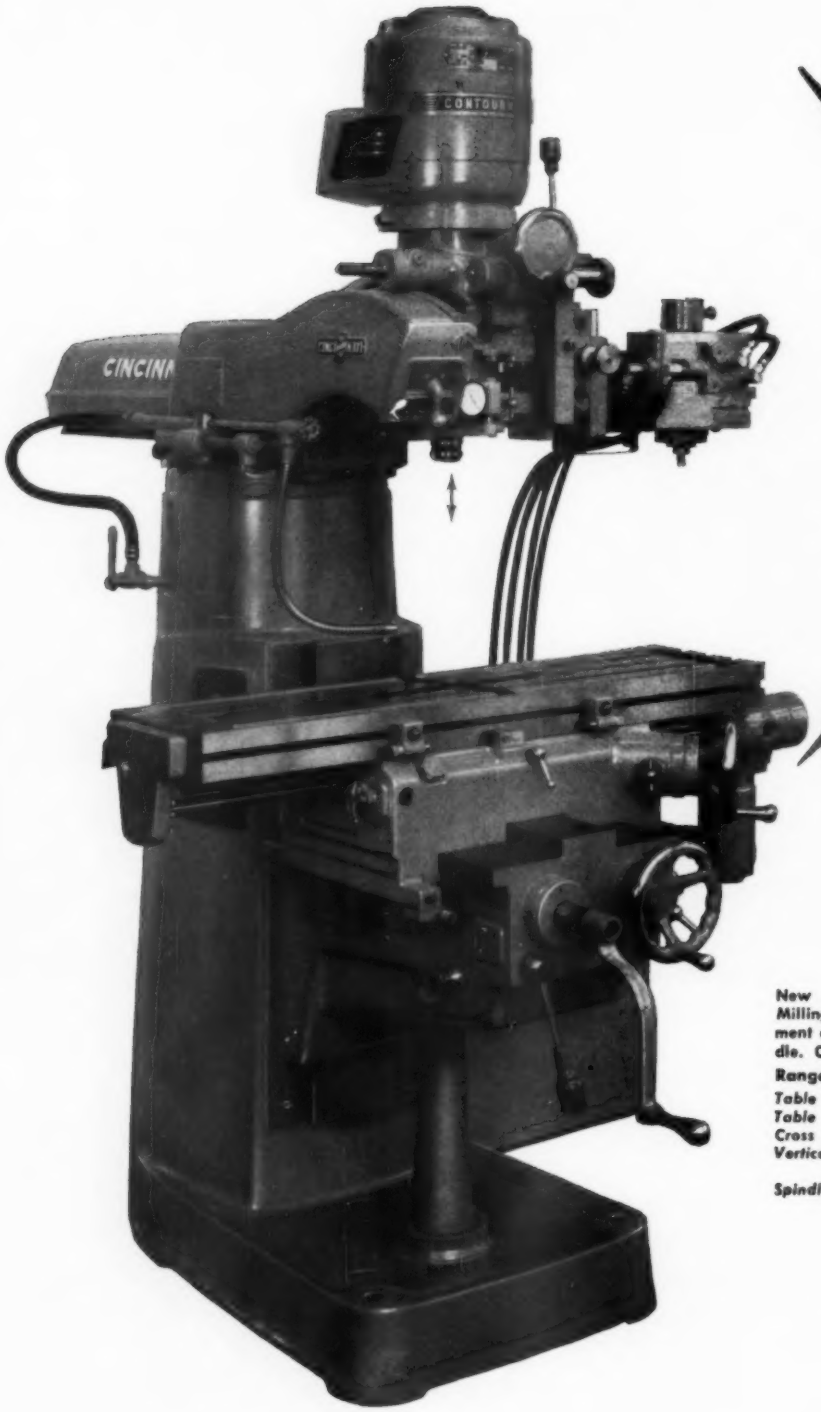

New

New CINCINNATI No. 1C Contourmaster Milling Machine. Arrows indicate movement of the cutter spindle, table and saddle. Catalog No. M-2008.

Range and Capacity

Table working surface	.....	42″ x 10″
Table traverse	.....	22″
Cross traverse	.....	10″
Vertical knee	.....	17″
Vertical quill	.....	3½″
Spindle drive motor	.....	1 hp

CINCINNATI

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Knee Type Milling Machines • Bed Type Milling Machines

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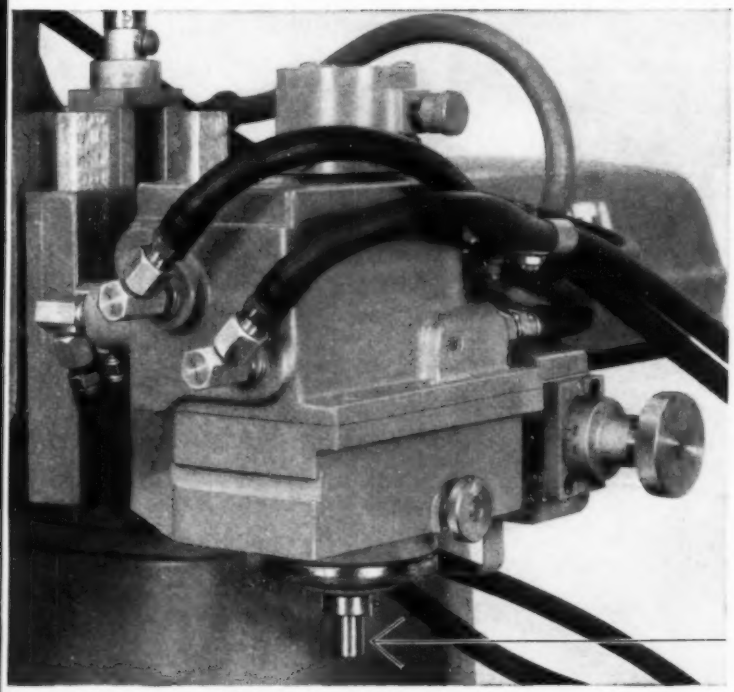
CONTOURMASTER 1-C



3-D Hand-Guided Hydraulic Tracer Unit, a standard feature of new CINCINNATI No. 1C Contourmaster Milling Machine. Arrow indicates tracer finger mounting stem.

FOR 3-D HAND-GUIDED HYDRAULIC TRACER MILLING

3-D milling has lost its high-cost status. Until recently, skillful manual manipulation of the machine sliding units or two types of power tracing operations were required. CINCINNATI No. 1C Contourmasters have changed all this. These new milling machines retain all the familiar Contourmaster advantages, and in addition, they are equipped with a three-dimensional hand-guided hydraulic tracer unit which provides the operator with easy power steering of the cutter and work in relation to each other. Any practical 3-D contour can be milled. Operation is easy to learn; just deflect the stylus (tracer finger) in the direction of movement desired.

Any desired combination of feed movements may be selected:

1) **All three movements active . . . for complete three-dimensional control**
2) **Vertical movement of spindle "blocked out" for 360 degree profiling in a horizontal plane**
3) **Cross feed "blocked out" for vertical profile milling using vertical and table feed movements**
4) **Table feed "blocked out" for vertical profile milling using vertical and cross feed movements**

And straight cuts in horizontal profile milling operations will proceed with very little manual attention. The stylus is merely deflected and locked in position while milling the straight length of the profile. For conventional toolroom milling, the tracing unit can be quickly disengaged. Hand feed controls are then employed. ¶Check into the many advantages of new CINCINNATI 1C Contourmasters for your tool and die shop. Complete information will be found in catalog No. M-2008.

Die Sinking Machines • Cutter and Tool Grinders

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THE CINCINNATI MILLING MACHINE CO.
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1 FELLOWS MADE THE FIRST GEAR SHAPER CUTTER

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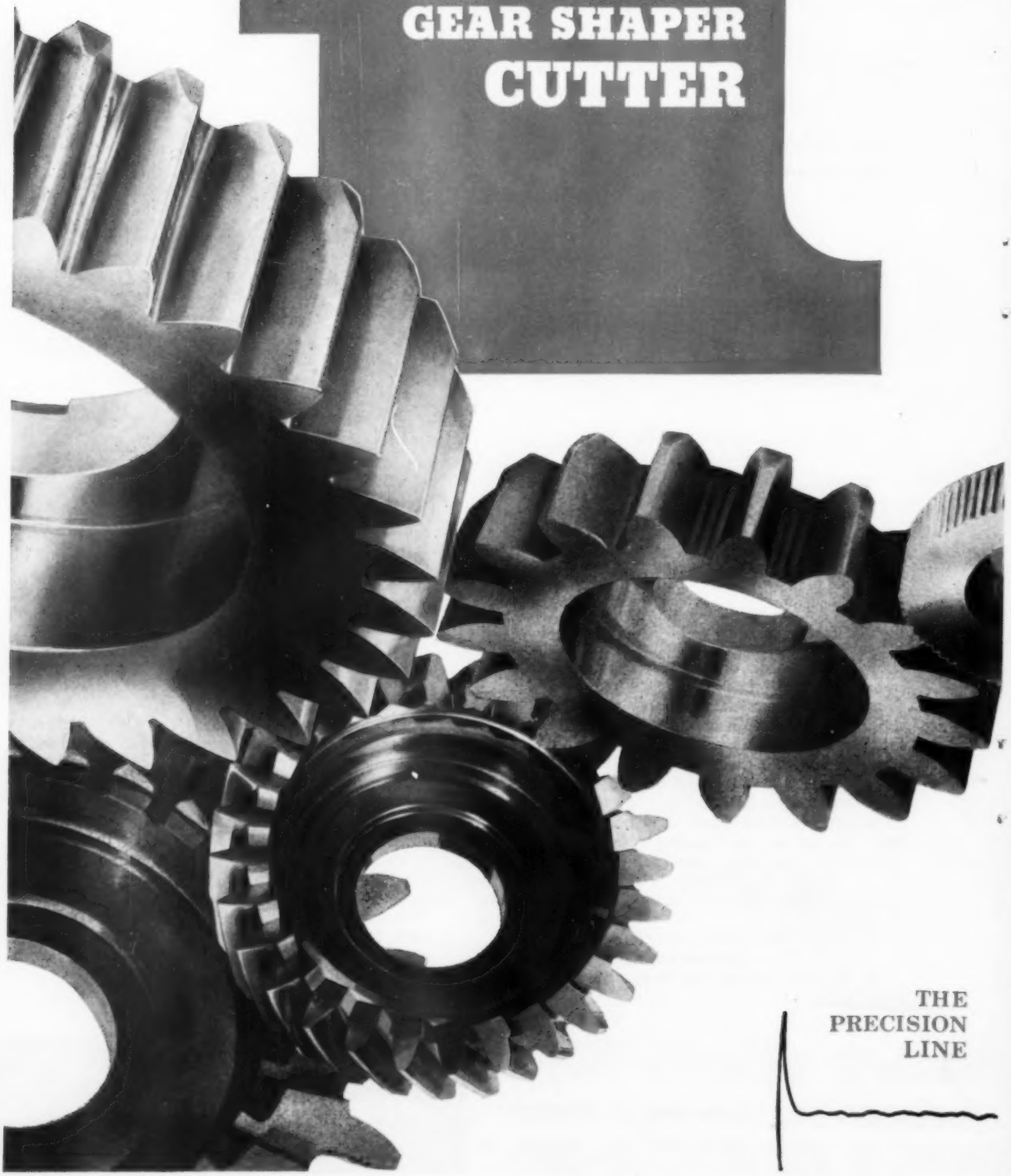

THE PRECISION LINE

FELLOWS
still makes the BEST

The Fellows Cutters you order today have unequalled experience behind their manufacture: the first gear shaper cutter ever made was designed, produced and patented by Fellows in 1897. Hundreds of thousands of Fellows Cutters have been made and used on gear production lines since that time.

This vast experience has resulted in constant progress, year after year, in cutter design and manufacture. Today, new gear and cutter designs are checked on a high-speed electronic computer which permits complete mathematical study of all possibilities. Constant advances in metallurgy and in manufacturing methods assure outstanding cutter performance on every gear production job.

A booklet, "Fellows Gear Shaper Cutters", covers the subject in detail. It includes tables of stock cutters, design considerations, sharpening methods, and other information. For a copy, contact any Fellows office.

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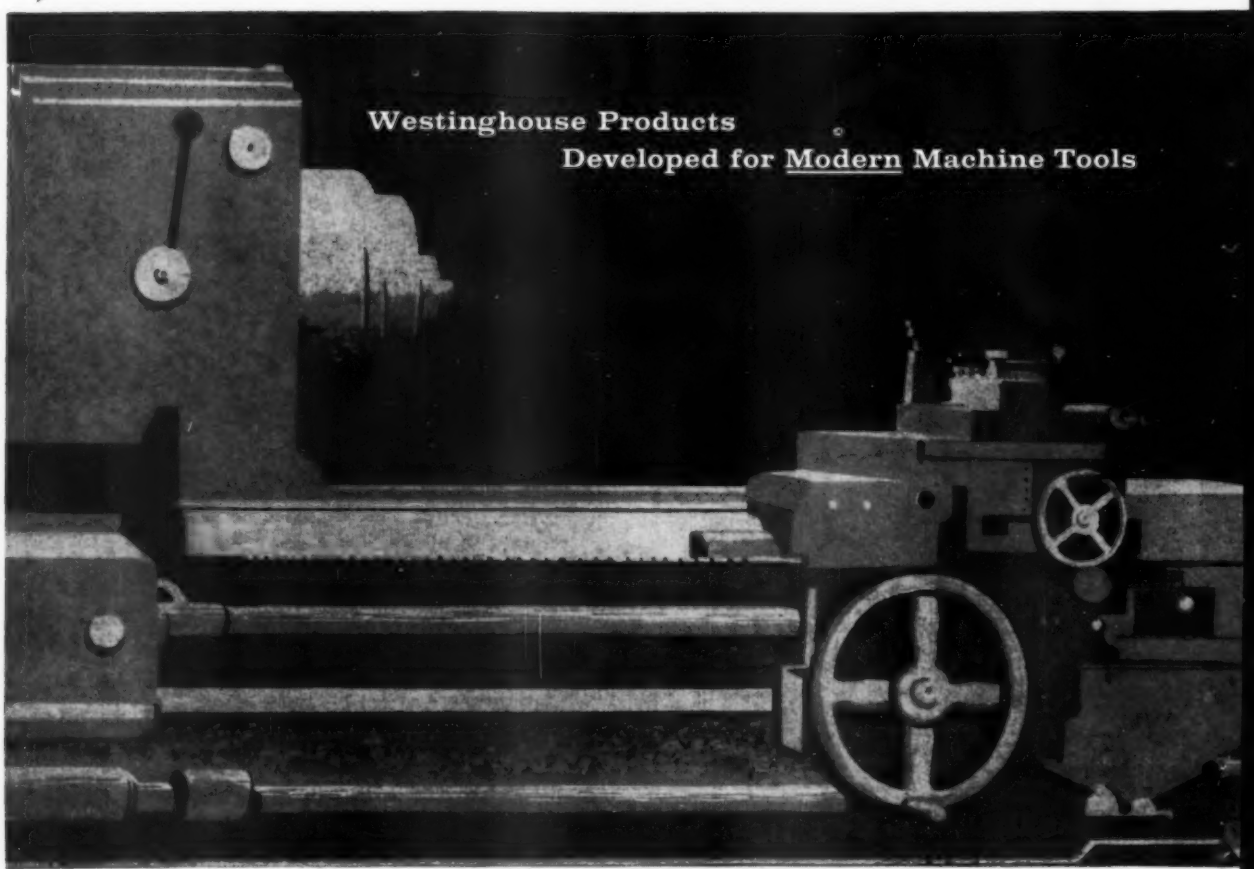
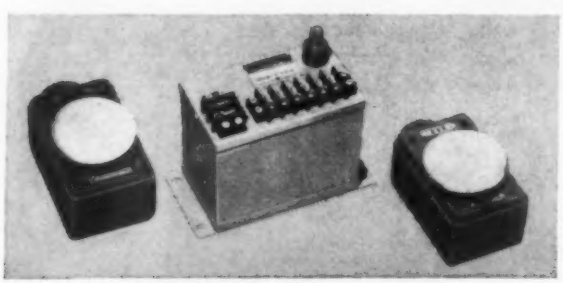
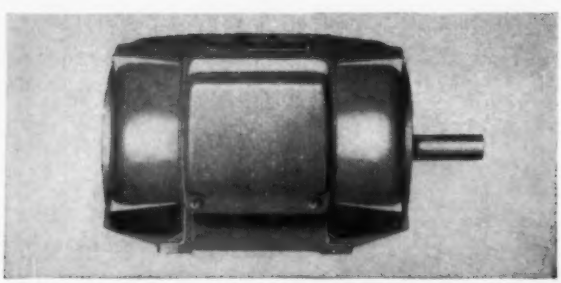
NEW NULTRAX ACCURATE TO





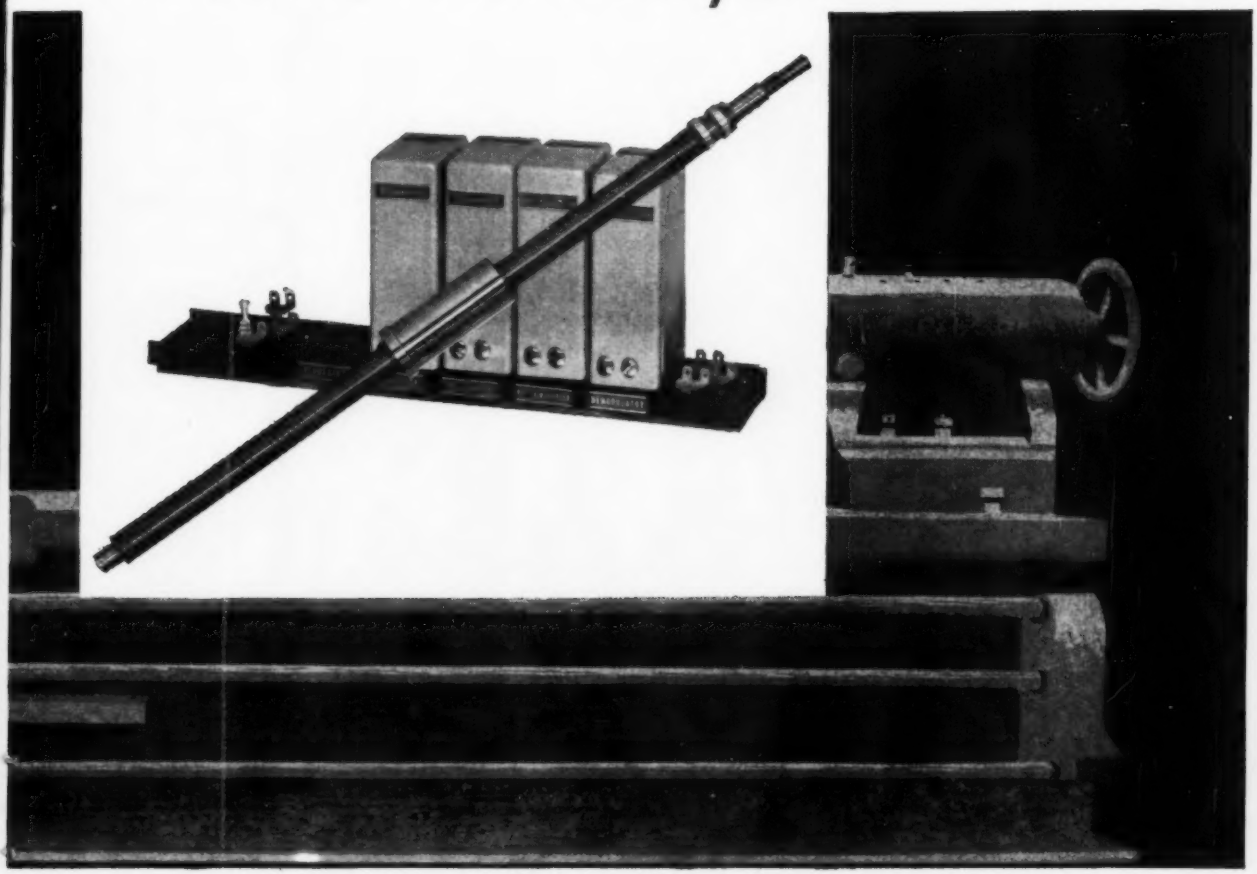
New Westinghouse Cypak® Dual Safety Interlock is a highly reliable, anti-repeat safety device for punch press operation—completely static; no moving parts, contacts or tubes to wear or burn out.



Westinghouse Life-Line® *"A"* a-c motor, the industry standard, combines Bondar®, Bondite and Mylar* insulation for long life. Prelubricated, factory sealed bearings eliminate need for lubrication—keep lubricants in, dirt out.

*Du Pont registered trademark

WESTINGHOUSE CONTROL 1 PART IN 100,000



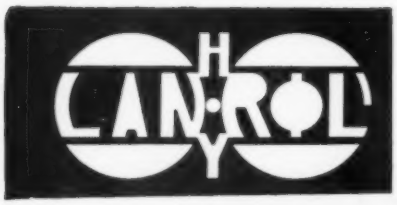
Unaffected by wear and free from backlash, NULTRAX linear positioning system makes possible the measurement of linear displacement on one or more axes to accuracies of one hundred thousandth of its full range of travel, which may extend over distances of many feet. NULTRAX and other Westinghouse numerical control systems are available to cover the complete range of production accuracies.

Positioning systems are another example of Westinghouse products—the sign of a modern machine tool designed to give the most production at the lowest possible cost. A coordinated electrical system, designed and supplied by Westinghouse industry-experienced engineers, is sure to give the best in long-term economical service.

For complete information about NULTRAX and other Westinghouse POWER-UP products for modern machine tools, ask your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-96112

YOU CAN BE **SURE**...IF IT'S

Westinghouse



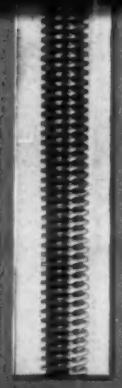
THREAD ROLLING

Field installations of the new LANHYROL Thread Rolling Machine are producing outstanding results. Production data from representative jobs, shown on the opposite page, indicate the unequalled output, flexibility, and range coverage of this revolutionary new machine, not available anywhere else in the Western Hemisphere.

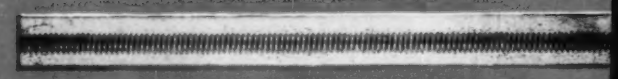
The LANHYROL Thread Rolling Machine produces strong, accurate threads of excellent finish by the chipless, cold-forming process using four different Rolling Methods—Thrufeed, Infeed, Continuous, and Reciprocal. It will thread all diameters from $\frac{3}{16}$" to 3", producing left- and right-hand threads of all types (except square), including UNC, UNF, Acme, worm, and many special forms.

Additional information on request—please send specifications and ask for Bulletin E-60.

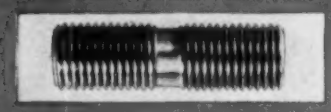
467C



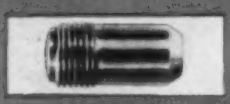
WORKPIECE: Jack Screw
MATERIAL: C1018 Steel
THREAD SPECIFICATIONS: 1"-5 pitch 29° Acme
TOLERANCE: Class 4C
METHOD: Thrufeed Rolling
PRODUCTION: 30" per minute (rolled in 36" lengths—can be rolled in 12" lengths)



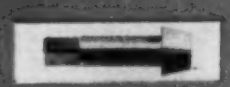
WORKPIECE: Timer Switch Leadscrew
MATERIAL: B1112 and C1117 Steel
THREAD SPECIFICATIONS: ¼"-16 Pitch Stand-ard Acme
TOLERANCE: Class 3G
METHOD: Thrufeed Rolling
PRODUCTION: 46" per minute (rolled in 18" lengths—can be rolled in 12' lengths)



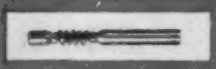
WORKPIECE: Double-End Stud
MATERIAL: C1040 and SAE 8620 Steel
THREAD SPECIFICATIONS: 2"-4½ pitch NC—3" thread length
TOLERANCE: Class 3
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 1½ min. rolling time per piece (both ends)



WORKPIECE: Barrel—MG Gun Per-forator
MATERIAL: 60 Carb. Silicon Tool Stl.
THREAD SPECIFICATIONS: 1⅞"-6 pitch Stub-Acme—1" thread length
TOLERANCE: Class 3G
METHOD: Infeed Rolling (hand-operated work-holding fixture)
PRODUCTION: 15 pieces per minute



WORKPIECE: Aircraft Bolt
MATERIAL: 4140 Steel of 36-40 Rock-well C
THREAD SPECIFICATIONS: 1"-14 pitch NF—1.5/16" thread length
TOLERANCE: Class 3A (Military Spec. MIL-B-7838-A)
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 10 pieces per minute



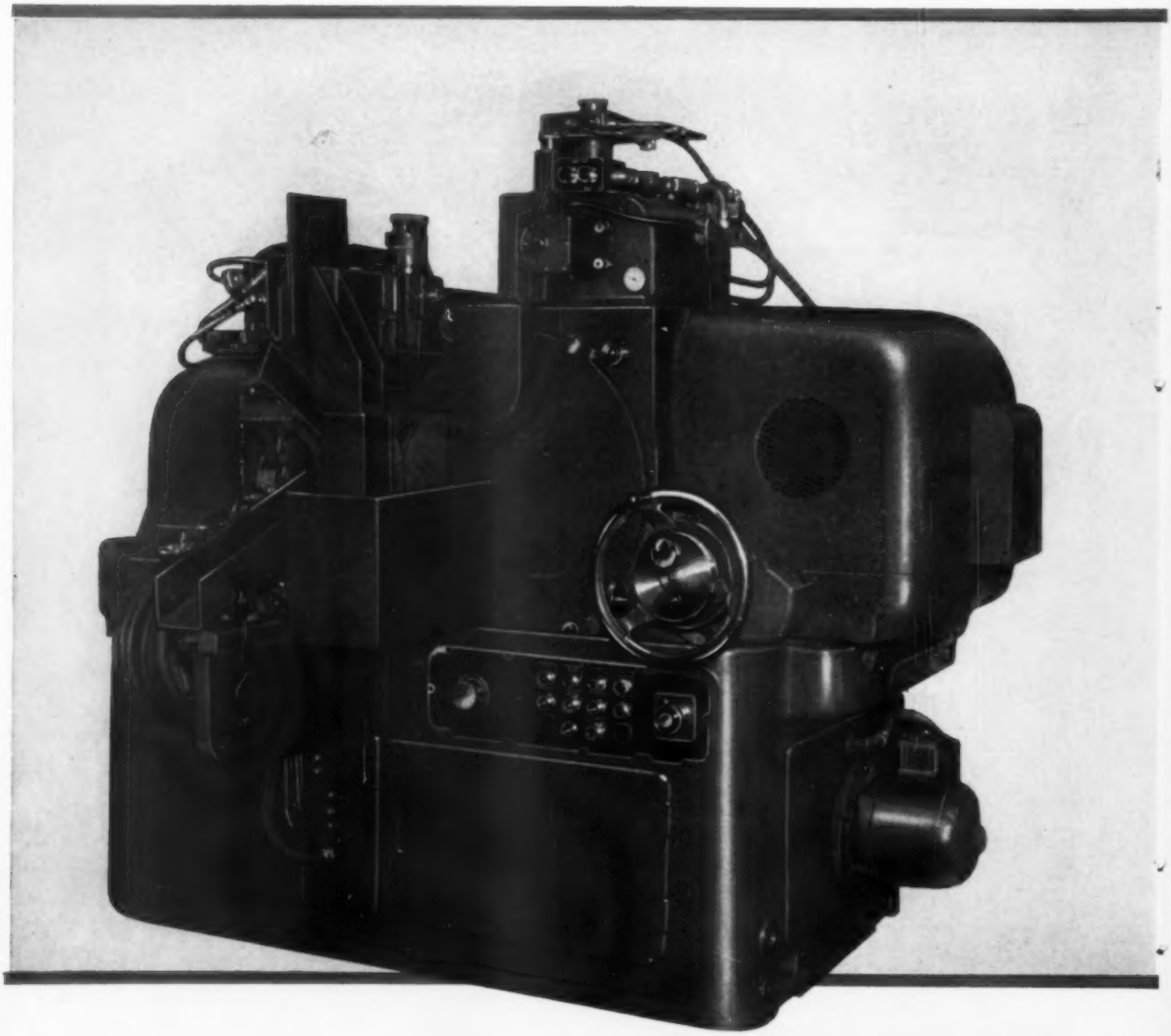
WORKPIECE: Transfer Drive Worm
MATERIAL: Stainless Steel
THREAD SPECIFICATIONS: ¼"-26 diametral pitch, left-hand, single—¾" thread length
TOLERANCE: .1825—.1805 P.D.
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 20 pieces per minute

LANDIS
Machine
COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

Landis Centerless with automatic

. . . form grinds file blanks from straight stock;



Machine:	Landis No. 12½ Centerless Grinder
Part:	Five sizes of round files —high carbon steel
Operation:	Grinding from straight cylindrical blanks
Tooling:	Automatic loading and unloading
Size limit:	± .003"
Production:	288 to 382 per hour —depending on size of file

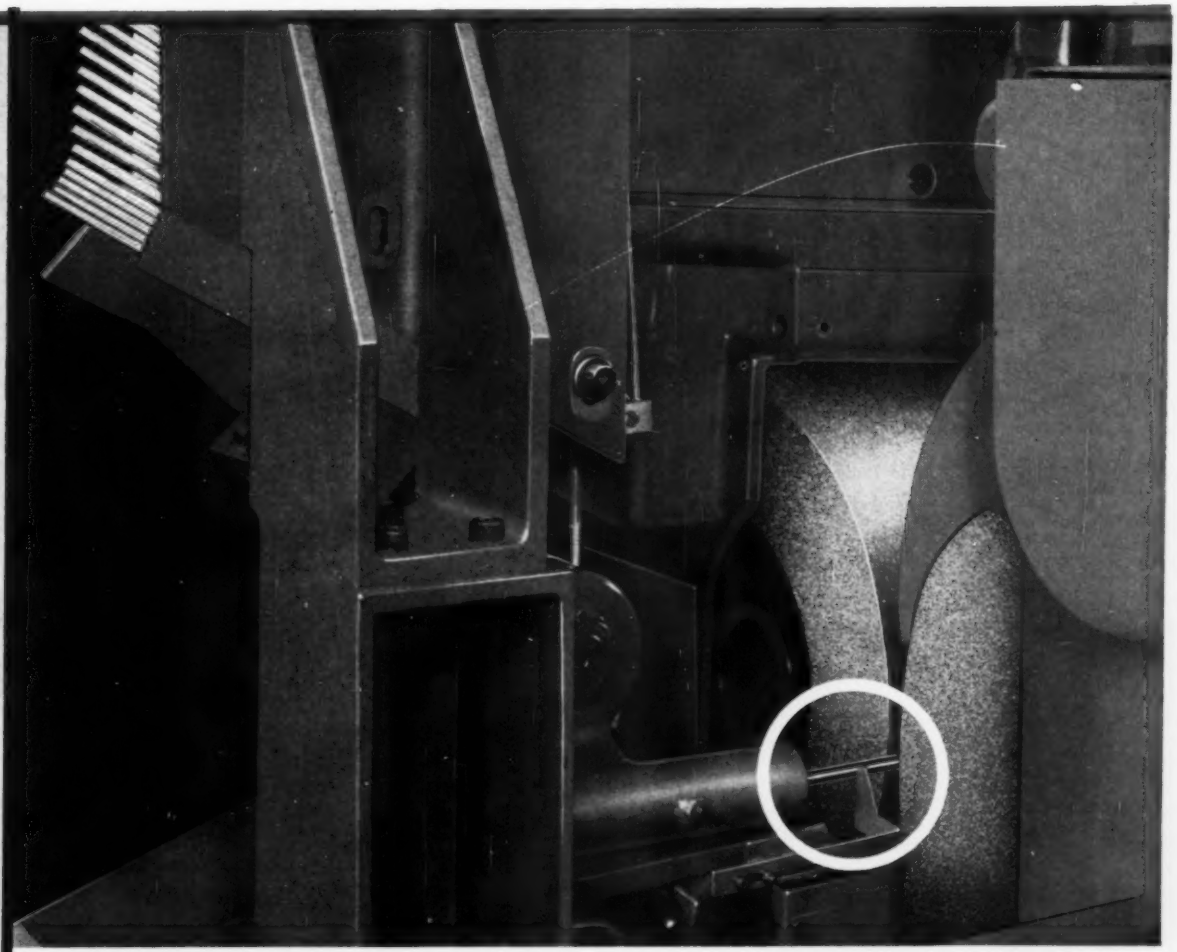
LANDIS
precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

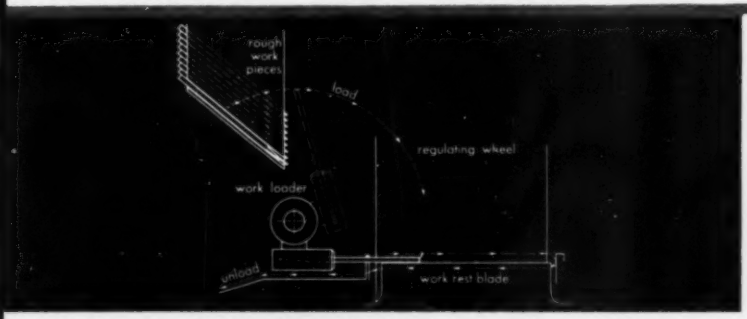
CIRCLE 210 READER SERVICE CARD

loader boosts production 144%

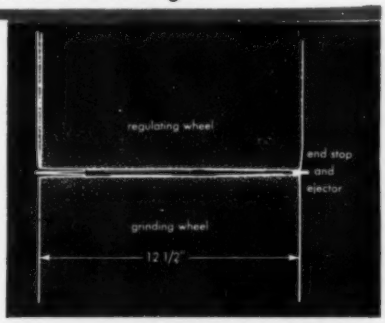
eliminates extra operations formerly required



LANDIS tooling engineered for this application provides automatic loading, cycling and discharge for considerable savings in time and costs. Photo shows workpiece during loading. This is followed by automatic grinding cycle and automatic discharge.



Automatic load and grind. Transfer arm takes workpiece from loading chute and places it between formed grinding and regulating wheels.



Using the end feed method, the file blank is ground to size. It trips the ejector at the positive stop.

CIRCLE 211 READER SERVICE CARD

LOOKING FOR MORE FROM

Trim steelcutting costs with Carboloy® Extra-Performance Grades 330, 350, and 370, and low-cost, General-Purpose Grades 78 and 78B

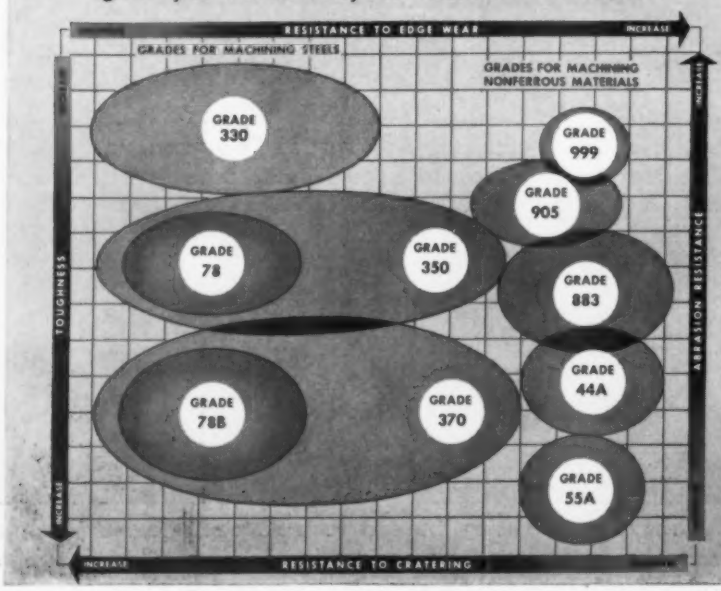
Some steelcutting jobs call for extra-tough, extra-performance carbides. Others can only be handled profitably with low-cost, general-purpose carbides. That's why we make them *both*.

Where you need increased machine productivity and have long production runs, to keep cost-per-piece low use Carboloy Extra-Performance Series 300 carbides. Their added strength and stamina handle jobs ranging from heavy roughing to high-speed finishing . . . at a cost and rate no "premium" carbide on the market can beat.

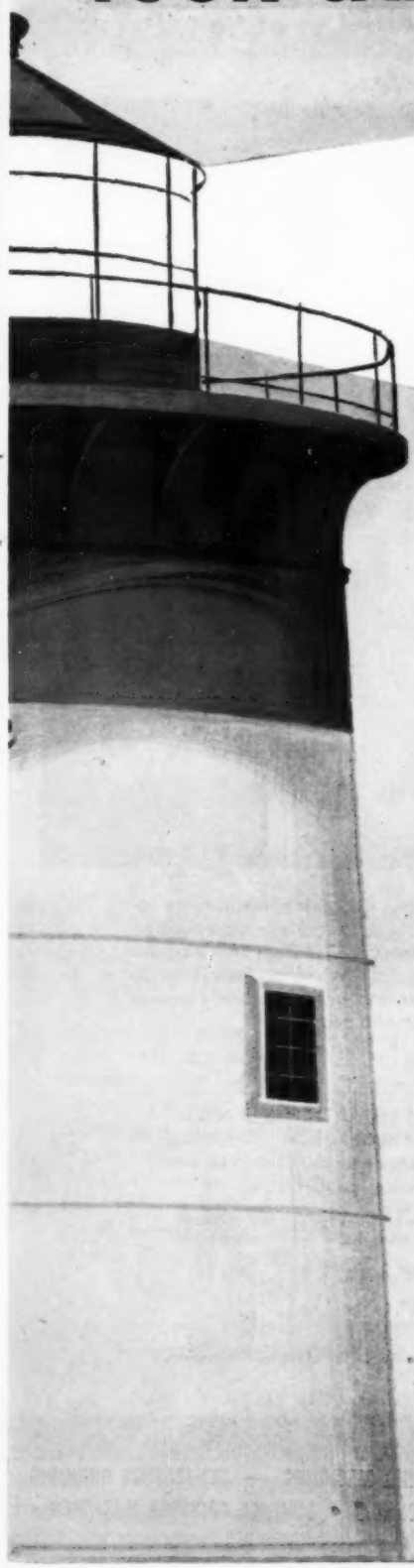
But, for general-purpose steelcutting jobs that don't require the Extra-Performance carbides, use Carboloy Grades 78 and 78B. Their top-notch performance, at low initial tool cost, will keep your machines operating profitably.

Chances are, your plant should be using *both* grades. Your local Authorized Distributor of Carboloy cemented carbides can deliver tools, blanks and inserts you need . . . in a hurry.

This complete team of Carboloy cemented carbides gives you more for your carbide tool dollar!



YOUR CARBIDE TOOL DOLLAR?



Cut nonferrous materials with low-cost Carboloy® Grades 44A and 883 . . . get longer tool life, increase production rates

These Carboloy cemented carbides are performance-matched to your cutting job for optimum machine productivity.

For interrupted cuts and tough production runs, use Carboloy Grade 44A. High shock resistance and good wear resistance make this a versatile grade for all machining jobs where a rugged carbide is needed.

When your job demands a carbide with built-in stamina and high wear resistance for general-purpose machining of nonferrous materials, use Carboloy Grade 883. You will get longer tool life and lowest cost-per-piece.

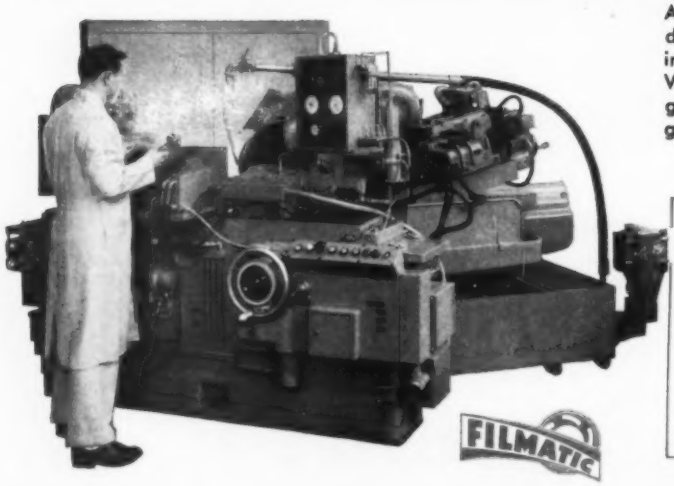
There are 5 Carboloy cemented carbides for cutting nonferrous materials, including Grades 44A and 883. One of these is designed especially for the particular characteristics of your cutting job to give maximum tool efficiency. Job-matched performance of these Carboloy nonferrous grades means better value for your cutting dollar.

To find out more about Carboloy Extra-Performance and General-Purpose carbides, or low-cost nonferrous grades, call or write: Metallurgical Products Department of General Electric Company, 11157 E. 8 Mile Boulevard, Detroit 32, Michigan.

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

CINCINNATI FILMATIC Angular



Automatic sizing and flagging combined are indicative of the cost-reducing ideas incorporated in a CINCINNATI FILMATIC 10"R x 18" Angular Wheel Slide Grinding Machine, tooled up to grind the diameter and adjacent face on drive gears in one automatic cycle.

CINCINNATI FILMATIC 10"R x 18" Angular Wheel Slide Grinding Machine. Range and sizes listed below. Write for catalog No. G-686-1.

Size	Between-Center Lengths	Wheelhead Drive
6"R } 10"L }	18" and 30"	7½ hp
10"R } 14"L }	18", 36", 48" and 72"	15 hp

Sweet's Machine Tool File contains brief specs.

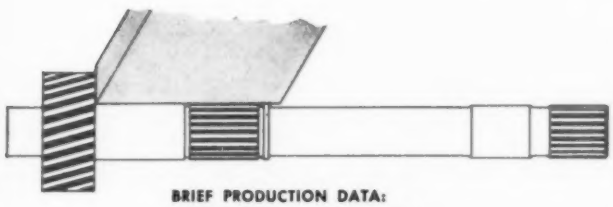
CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

Wheel Slide Grinders

combine diameter and shoulder operations, and give you 16 additional feature-advantages

Big reductions in cost often are attained by combining operations. Consider precision centertype grinding, for example. CINCINNATI FILMATIC Angular Wheel Slide Grinders combine two or more diameter and shoulder grinding operations into one rapid automatic cycle. In addition, these fine precision grinding machines offer the 16 additional advantages tabulated at the right. ¶ An example of a typical part ground on a CINCINNATI is illustrated below, and a close-up of the operation is shown at the left.



BRIEF PRODUCTION DATA:

Part Name	drive gear
Material	steel
Operation	grind diameter and adjacent face as illustrated
Stock Removal	.010" max.
Production Potential	up to 100 per hour

A second machine grinds the other side of the gear and the diameter adjacent to it. These machines, tooled up by Cincinnati Grinding Specialists, are indicative of the way in which Cincinnati can help you reduce costs through direct replacement and/or improved methods. Want to know more? Let us hear from you. Meanwhile, you might want to look at brief specs on the entire Grinding Machine Division line in Sweet's Machine Tool File.

CINCINNATI

1. FILMATIC bearings for the grinding wheel spindle
2. Automatic grinding wheel balancing
3. Push-button automatic infeed cycle
4. Automatic hydraulic table clamp
5. *Automatic air-electric gage sizing. Cycle time stabilizer included
6. *Automatic gap eliminator (minimizes time spent in "cutting air")
7. *Behind-the-wheel profile truing
8. *Manual or automatic flagging
9. Sizing adjustment dial graduated in increments of .000050"
10. Coarse and fine feed rates incorporated in automatic grinding cycle
11. Easy to set up and operate
12. Roll-out cutting fluid tank
13. Independent hydraulic tank and pump
14. All V-belt headstock drive
15. Automatic filtered pressure lubrication
16. Heavy, well proportioned castings made in our own foundry

Equipment available at extra cost

MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

Grinding Machine Division
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

REPUBLIC COLD FINISHED ALLOY BARS Help Cut Machining Costs

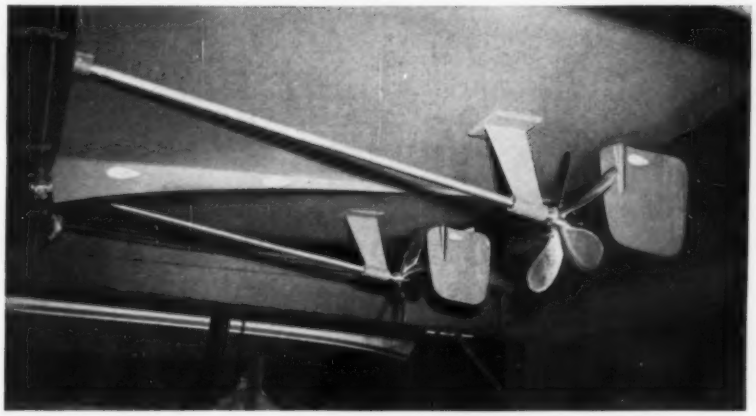
NOTHING LESS THAN TOP QUALITY MATERIAL is satisfactory for the manufacture of S. M. Jones Sucker Rod Couplings and Polished Rods. Republic Cold Finished Alloy Bars have proved more than equal to physical and economic demands. Long-term, satisfactory service is assured.

Great strength, precise tolerance, and reasonable cost are routine requirements established by the S. M. Jones Company, Division of Buffalo Eclipse Corp., Toledo, Ohio, in the production of Sucker Rod Couplings and Polished Rods. Used to join and suspend thousands of feet of sucker rods in oil wells "on artificial lift", these parts must withstand enormous static and dynamic loads, to more than 40,000 psi.

Republic Cold Finished Alloy Bars provide the strength and stamina to meet these brutal service conditions with margins to spare. What's more, exactness in size and cross section of the cold drawn product minimizes required machining. And, since the cold drawing process produces a marked improvement in machinability, higher feeds and speeds can be employed—tool life increased—and finish improved. All of these factors mean substantial reductions in machining costs.

Republic produces a complete line of carbon, alloy, leaded, and ENDURO® Stainless Steel cold finished products to meet virtually any requirement. Moreover, complete facilities for furnace treatment are available. Republic metallurgists will be glad to help you in the selection of analyses and processing to suit your particular application.

For complete data on Republic Cold Finished Alloy Bars, contact your nearest Republic representative, or mail coupon.



REPUBLIC COLD FINISHED STAINLESS STEEL BARS help solve a vibration problem in power cruisers produced by Roamer Steel Boats, Division of Chris-Craft Corporation, Holland, Michigan. Used for drive shaft production, uniformly straight Republic Cold Finished ENDURO Stainless Steel Bars eliminate vibration caused by out-of-true shafts. In addition, Republic Cold Finished ENDURO Stainless Steel Bars provide superior strength and machinability. Their corrosion-resistance permits operation in water where pollution often attacks other metals severely. Send coupon for facts.

REPUBLIC COLD FINISHED LEADED STEEL BARS help the Henry L. Hanson Company, Worcester, Massachusetts, secure screw extractor performance and production advantages. First, the number of rolling operations required to produce spirals on extractors have been substantially reduced. Second, the high degree of machinability provided by the Republic Cold Drawn Leaded Alloy Steel used results in lower machining costs. Third, service demands for hardness and toughness are more than met. After scientific heat treatment, finished extractors are practically unbreakable. For further information, send coupon.

REPUBLIC COLD FINISHED CARBON STEEL BARS are subject to heavy roll-threading and machining operations by the Norton Company, Worcester, Massachusetts, in the production of pulpstone studs. Completed studs, used to anchor abrasive segments of pulpstones, are subject to enormous stresses in pulp grinding operations. The excellent machinability, formability, and strength characteristics of Republic Cold Drawn Steel helps Norton meet all of these requirements—at a cost far less than previous materials permitted. Mail coupon for data on the many benefits offered by Republic Cold Drawn Steel Bars.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. AM-6268
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following types of Republic Cold Finished Steel Bars:

☐ Alloy ☐ ENDURO ☐ Leaded ☐ Carbon

Name_____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

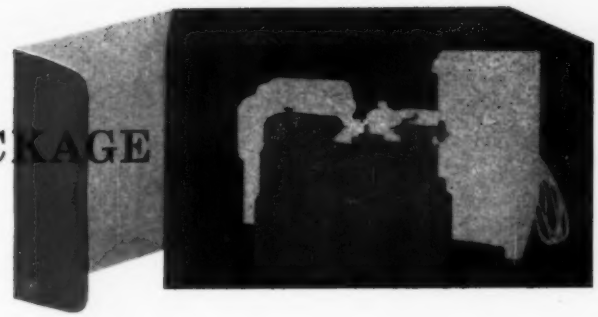
NOW—Monarch 10″ Model EE Performance . .

The Series EE, Model 1000 Precision Lathe for toolroom use. A machine for master toolmakers. Combines super-precision, extreme versatility and productiveness. Consider the cost reducing possibilities represented by the specifications listed below.

Swing over bed	15½″
Length between centers	30″ and 54″
Main drive motor	20 H. P.
Weight, 30″ machine	10,000 lbs.
Infinitely variable speeds up to	2,000 R. P. M.
Thread and feed changes	66

Electronic main drive motor control
Electric speed change
Four-way power rapid traverse
Built-in constant surface cutting speed

. . . in a KING-SIZE PACKAGE

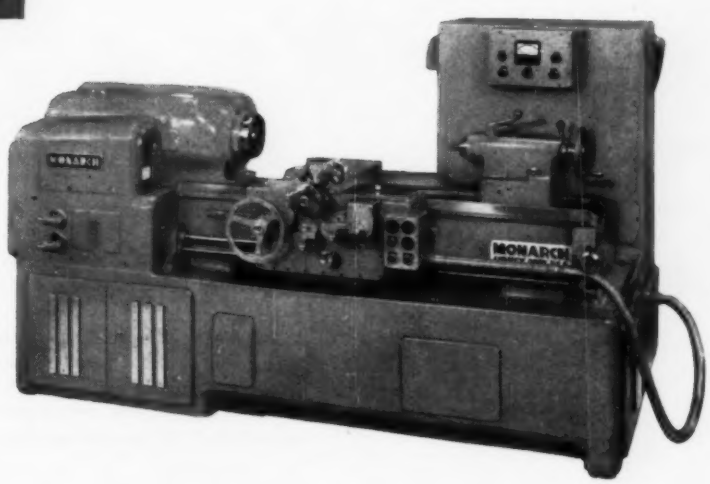


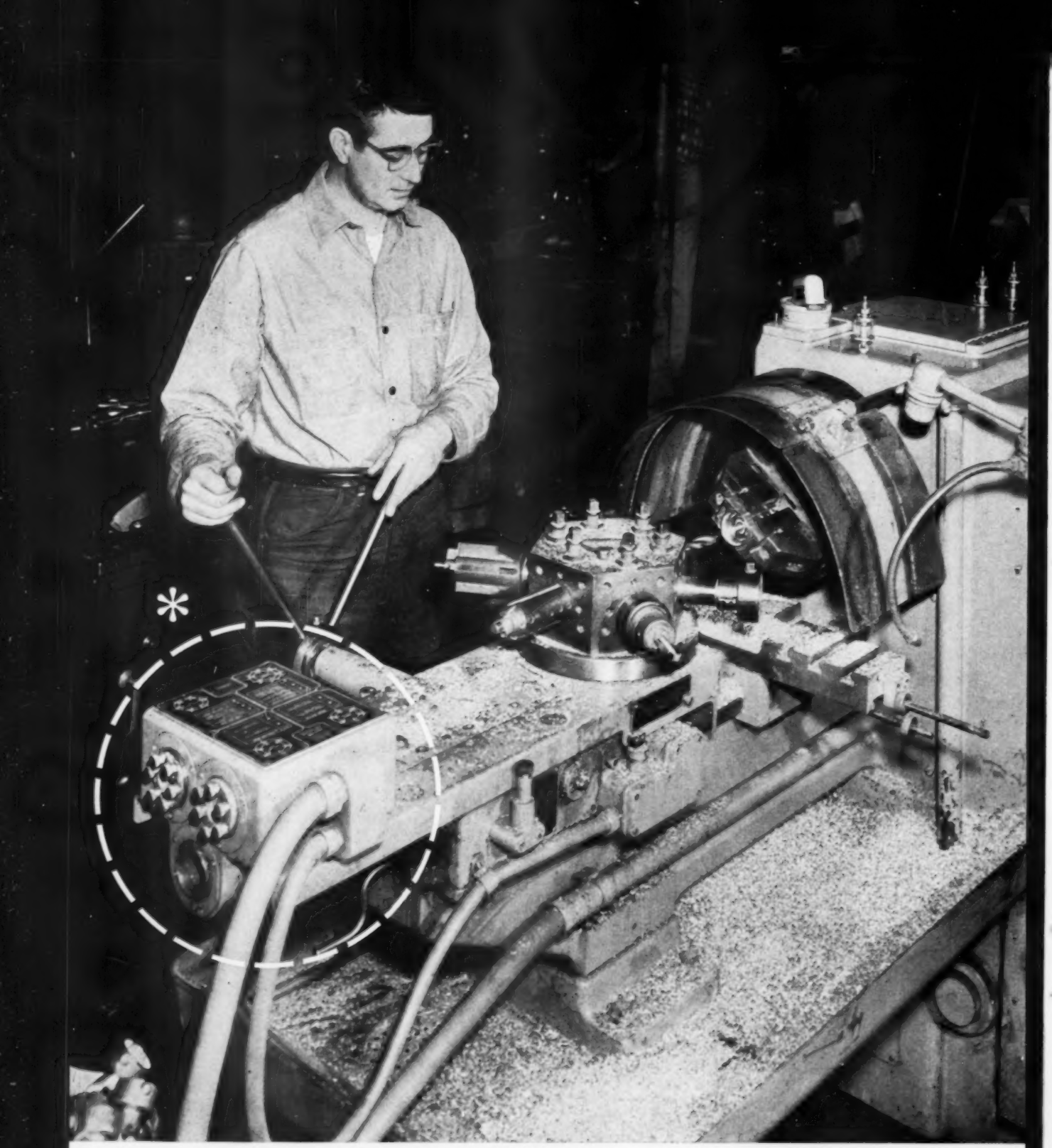
Are you faced with out-of-the-ordinary precision turning requirements? Have you longed for lathes having greater power, speed and versatility? If the answer is yes, here's great news.

The famous 10" Monarch Model EE Lathes now have two husky big brothers—the Series EE, Model 1000 Precision Lathe equipped either for toolroom or manufacturing use. They've got everything that's sold more than 6000 ten-inch Lathes to date—plus! Plus greater swing, more distance between centers, more power, more beef, more capacity and *inbuilt constant surface cutting speed.* Come see them in action!

It's EEze to reduce your turning costs with the Monarch family of EEs. Write for full information.
The Monarch Machine Tool Company, Sidney, Ohio.

The Series EE, Model 1000 Precision Lathe for manufacturing use. For precision production on all types of lathe operations except thread chasing. This machine is provided with a simplified six-feed gear box with either one of three feed ranges being available. It's stripped down, ready for action in *your* plant.

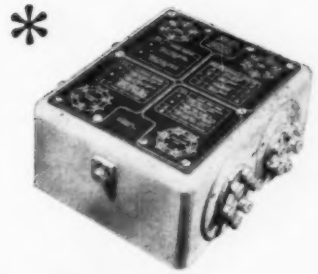




Here's the electric "brain" of the versatile Warner & Swasey 16" Electro-Cycle. Your operator merely selects the required spindle function for each turret face —start, stop, reverse and speed—by simply presetting the control drum buttons. Correct spindle functions are then actuated at the right time—much faster than could be accomplished by manual operation. And it never forgets.

CIRCLE 220 READER SERVICE CARD

At Anderson Electric Corporation...



Electric "Brain"

on Warner & Swasey 16" Electro-Cycle® Turret Lathe

- **AUTOMATICALLY COMMANDS ALL SPINDLE FUNCTIONS**
- **REDUCES MACHINE HANDLING TIME**
- **INCREASES PRODUCTION 50%**

Installation of Anderson Electric's new 16" Electro-Cycle enabled them to eliminate all third-shift operation on two turret lathes formerly required to maintain production schedules!

This progressive Birmingham, Alabama, manufacturer of electrical connectors and fittings especially like their Electro-Cycle's:

- **Fast Setup—especially valuable on small lot production (10 to 1000 pieces)**
- **Unique Spindle Positioner that stops the chuck at the same place—ideal for establishing time-saving loading and unloading rhythm**
- **Tolerance Holding Ability—.002 inch total**
- **Automatic Spindle Reverse for accurate threading—fast, easy tap and die removal**

In production shops everywhere, the 16" Electro-Cycle is busy cutting costs, reducing workpiece and machine handling time, and lessening operator fatigue. That's because it was specially designed by Warner & Swasey engineers for machining non-ferrous materials such as—brass, bronze, aluminum, magnesium, hard rubber and plastics.

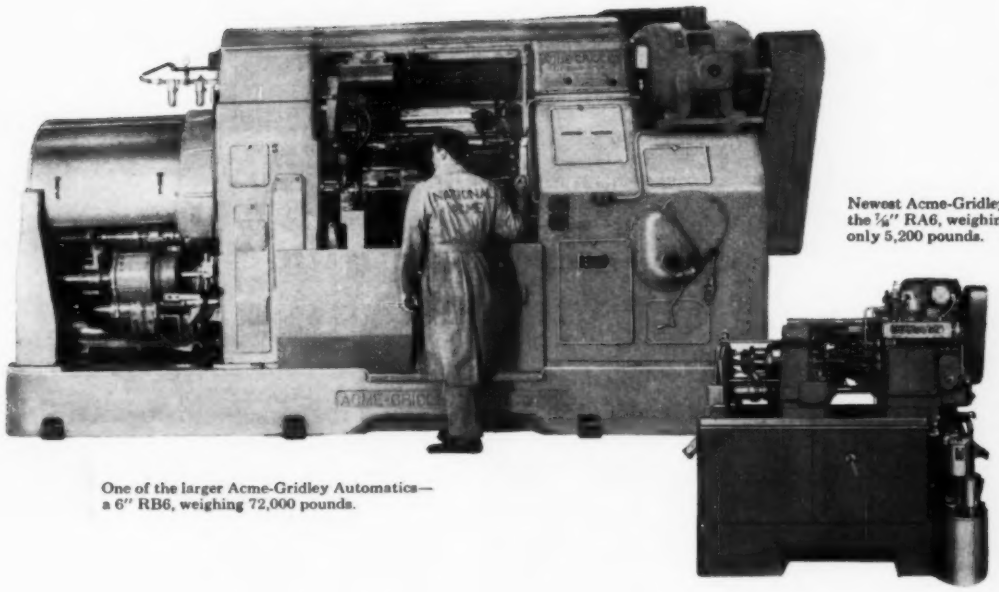
Contact your Warner & Swasey Field Representative and see how this versatile turret lathe can make your non-ferrous jobs more profitable.

®Reg. U.S. Pat. Off.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

Produce parts like these on



Newest Acme-Gridley—the 7/8" RA6, weighing only 5,200 pounds.

One of the larger Acme-Gridley Automatics—a 6" RB6, weighing 72,000 pounds.

ACME-GRIDLEY automatics...

FORGET SECONDARY OPERATIONS!

Most parts machined on Acme-Gridleys are *completed* on Acme-Gridleys. Using these Automatics, you eliminate costly rehandling and, in many instances, avoid a sizeable second-machine investment.

The advantage applies to parts weighing fractions of ounces or hundreds of pounds. And the wide-open tooling zone of every Acme-Gridley lends itself to a broad range of installations limited only by the tool engineer's ingenuity. It means that, for sheer capacity range, no line of automatic production equipment in the world equals Acme-Gridley.

If you produce parts like the ones illustrated, then Acme-Gridley Automatics must be in your present plans. Our representative can give you expert assistance without obligation.

National Acme

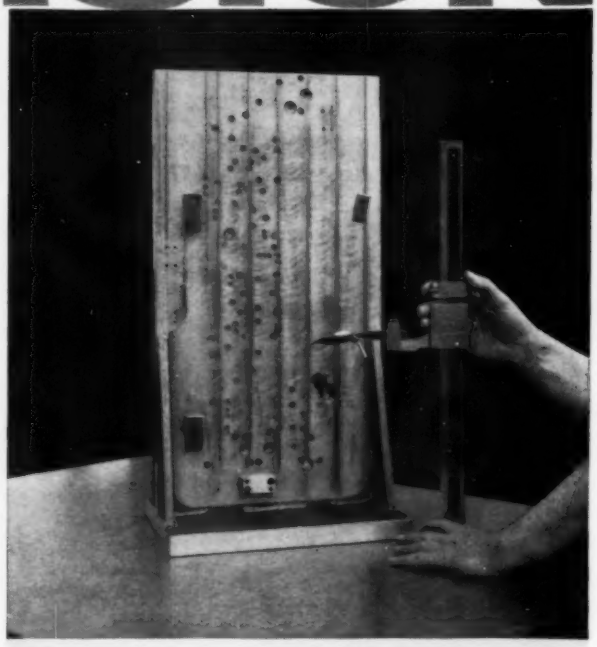
THE NATIONAL ACME COMPANY, 171 E. 131st ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N.J., Chicago 6, Ill., Detroit 27, Mich.

CIRCLE 223 READER SERVICE CARD

PRECISION

HOLES LOCATED TO ±.0001", FAST

with Fosdick Automatic Positioning and Direct Dimension Measuring. (Operator sets hole locations direct from blueprint on two direct-reading drum dials.) With B-F Spindle, tools are changed in less than 10 seconds, accurate to ± .0001" of original setting.



"THIS JOB WOULD TAKE 20% LONGER

on our other jig borer, but it couldn't be done with such accuracy. Wouldn't even attempt it without our Fosmatic!"

FOSMATIC JIG BORERS

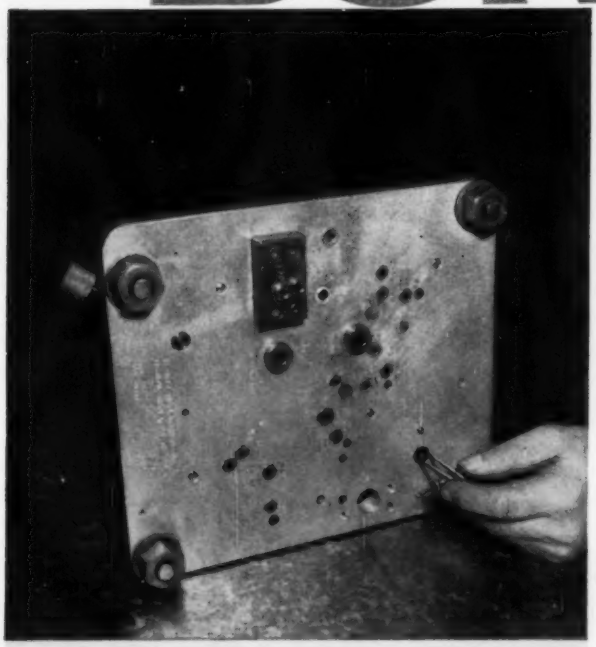
We asked Textile Machine Works, Reading, Pa., what specific advantages they gained with their new Fosmatic Jig Borer, and here's what they said:

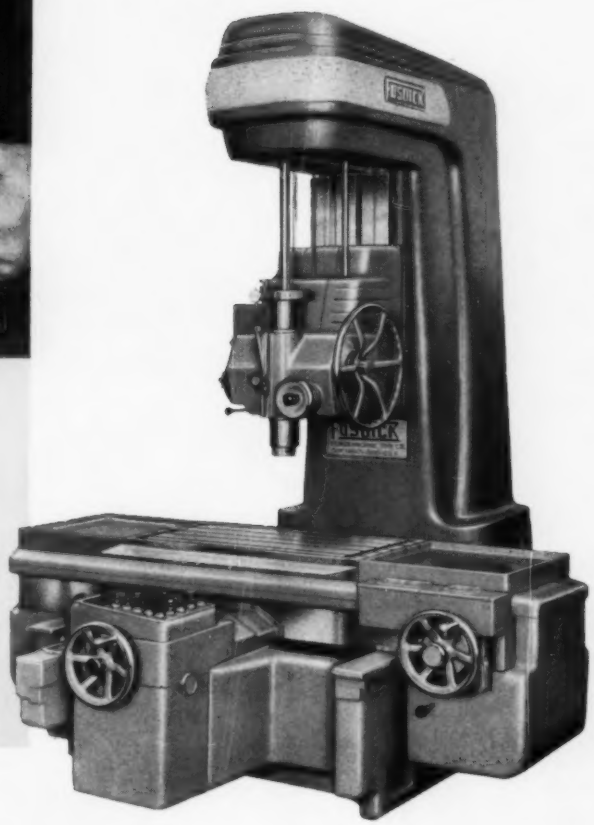
"Time saving? It's hard to say. Might be 20% on one job, 40% on another. But those are just estimates. How can you compare apples and oranges? The Fosmatic and our other jig borer are worlds apart.

"The important thing is we meet all accuracy requirements *the first time* on our Fosmatic. Rejects are virtually a thing of the past. Moreover, we're doing work on our Fosmatic that we wouldn't even attempt on our other jig borer. The only accuracy problem

BORING

OF COMPLEX GAGES AND JIGS





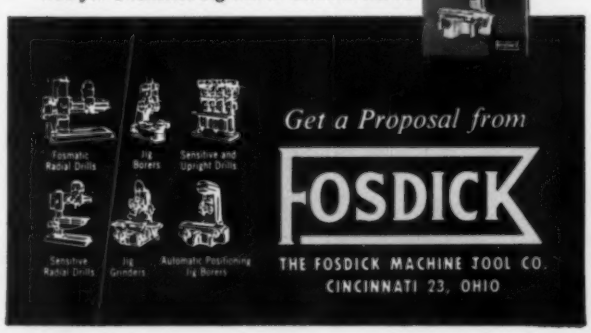
"FOSMATIC SAVED US 2 HOURS

on this 8 hour job, but the accuracy we gained is even more important."

we have now is controlling the temperature of the workpiece!"

On Fosmatic Jig Borers, positioning accuracy depends upon highest quality gages, not upon screw-threads. This feature and Fosdick's unique anti-friction quill design assure dependable accuracy. Fosmatic Jig Borers bring you many important advances in boring technology including numerical control by punched cards or tape. Where progress has been so great, the obsolescence of your old machine may be more costly than you suspect. *Why not run a check?* Call your Fosdick Distributor or write us today.

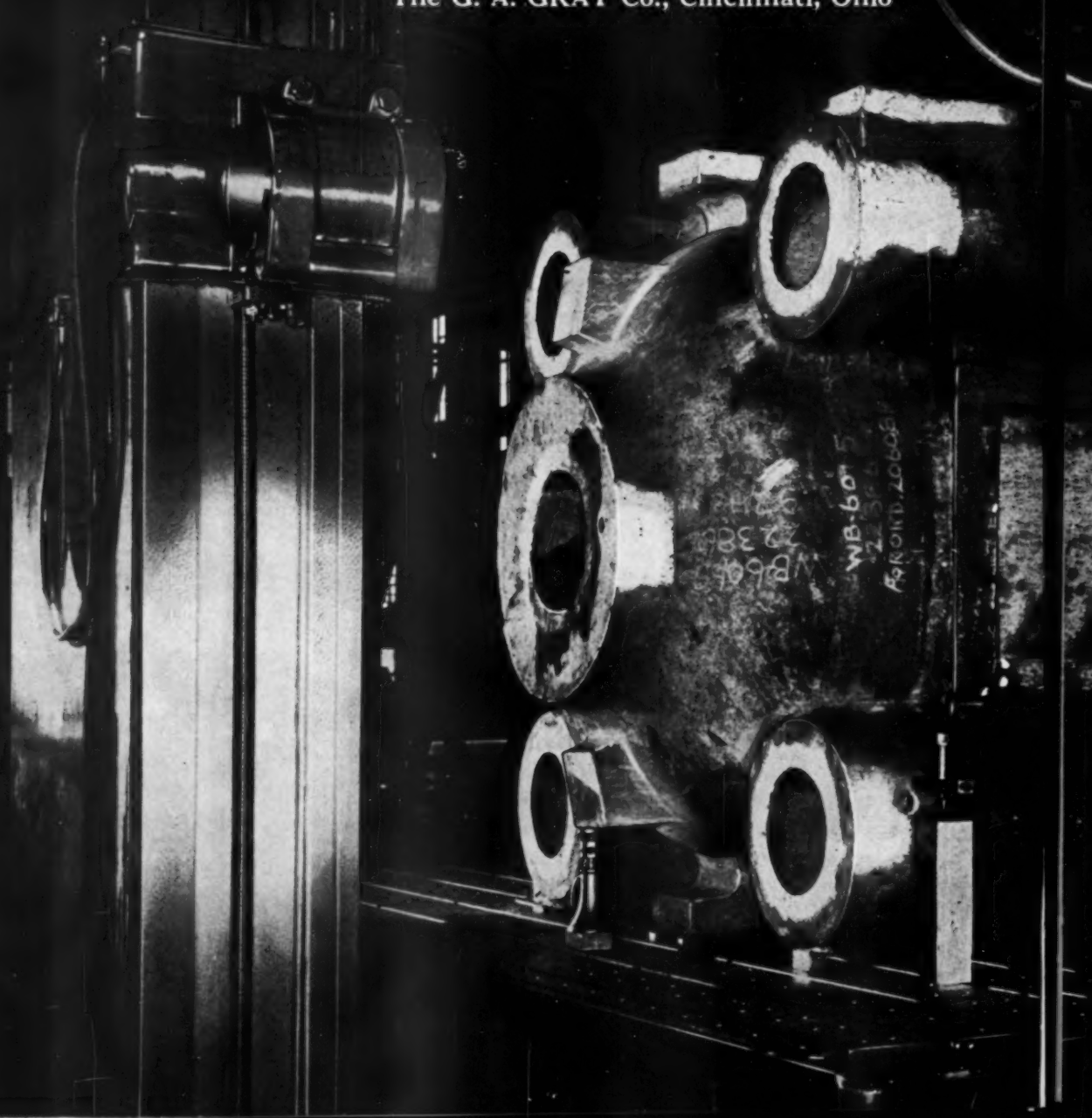
Ask for Fosmatic Jig Borer Bulletin JB-A



brute POWER

. . . flows from this Gray giant at the touch of a button.
Its massive design and tremendous rigidity guarantee heaviest
carbide milling. Magically, precision boring to minute
tolerances is equally available on this 8″ Gray Horizontal.
Its amazing convenience permits small machine speeds
for the first time in the elephant field.
That's why . . . large jobs don't grow old on a Gray.

The G. A. GRAY Co., Cincinnati, Ohio



YARG
D D

New 23-Station
Avey Line-O-Dex

AUTOMATICALLY MACHINES

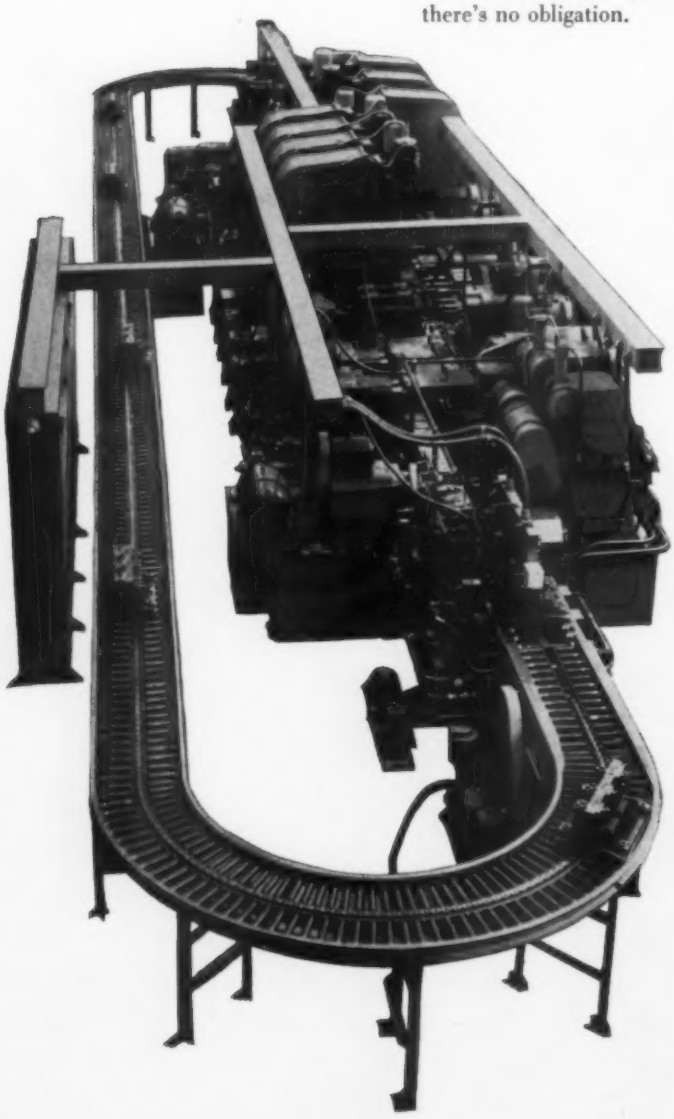
360 pump bodies
per hour

A leading automotive parts manufacturer—realizing that even their brand new machine tools could be economically obsolete—posed this problem:

"We need a new automated machine tool that will rough and finish mill, bore, drill, ream, probe, tap, wash, auto gage and assemble bushings on cast iron pump bodies we produce for use in automotive hydraulic steering systems. It must handle 360 pump bodies per hour at 100% efficiency."

Immediately our Avey Division field engineers made a detailed study of the operations involved, then submitted a complete Motch & Merryweather MTA (Machine Tool Analysis). As the result of their study, we designed and built this new 23-station Avey Line-O-Dex that met all our customer's detailed specifications.

Your machines *can* be obsolete, even though they're not worn out. Call our machine tool specialists now for a MTA that can mean both increased production—and profits too. Naturally there's no obligation.



MOTCH AND MERRYWEATHER

Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati

This new Avey Line-O-Dex was designed and built by Motch & Merryweather Machinery Company to provide the following fast automated cycle of operation on 360 cast iron pump bodies per hour at 100% efficiency:

1. *Rough and finish milling*
2. *Boring*
3. *Drilling*
4. *Reaming*
5. *Probing*
6. *Tapping*
7. *Washing*
8. *Auto gaging*
9. *Bushing assembly*

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, DRILLING AND SPECIAL MACHINERY

New Continuous
Trunnion
Sawing Machine

AUTOMATICALLY PROCESSES

1500 pistons
hourly

Leading automotive producers realize that machine tools can be obsolete—although only 6 months old—if newer machines can do the job better, faster, for less cost. In checking their production operations, a prominent automobile builder gave us this problem:

"Can you design and build a continuous trunnion sawing machine that will eliminate individual sawing operations necessary to prepare our aluminum engine pistons for further machining? It must combine fast sawing with automation to produce 1500 pistons per hour at 100% efficiency."

Our field engineers immediately studied this customer's existing piston sawing operation—then submitted a complete Motch & Merryweather MTA (Machine Tool Analysis). As a result of their findings, we designed and built this improved Continuous Trunnion Sawing Machine that met all the specifications outlined above. It efficiently and economically cuts away both risers and side gates from the pistons—automatically after loading.

Why not check your machine tools for economic obsolescence—even though they seem to be in perfect operating condition. It can pay off in increased production—and profits, too. Call us today. A Motch & Merryweather specialist will see you immediately. Naturally, there's no obligation on your part—only on ours to help improve your existing production machining processes.

MOTCH AND MERRYWEATHER

Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati

This new Motch & Merryweather Continuous Trunnion Sawing Machine was designed to provide the following fast, automatic cycle of operation:

1. *Manually load pistons into trunnion fixtures.*
2. *Trunnion rotates while mechanically clamping pistons in fixtures.*
3. *Cut-off side gates.*
4. *Cut-off risers.*
5. *Fixtures are mechanically unclamped—then pistons are gravity unloaded onto take-off conveyor.*

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, DRILLING AND SPECIAL MACHINERY

Automatic Positioning

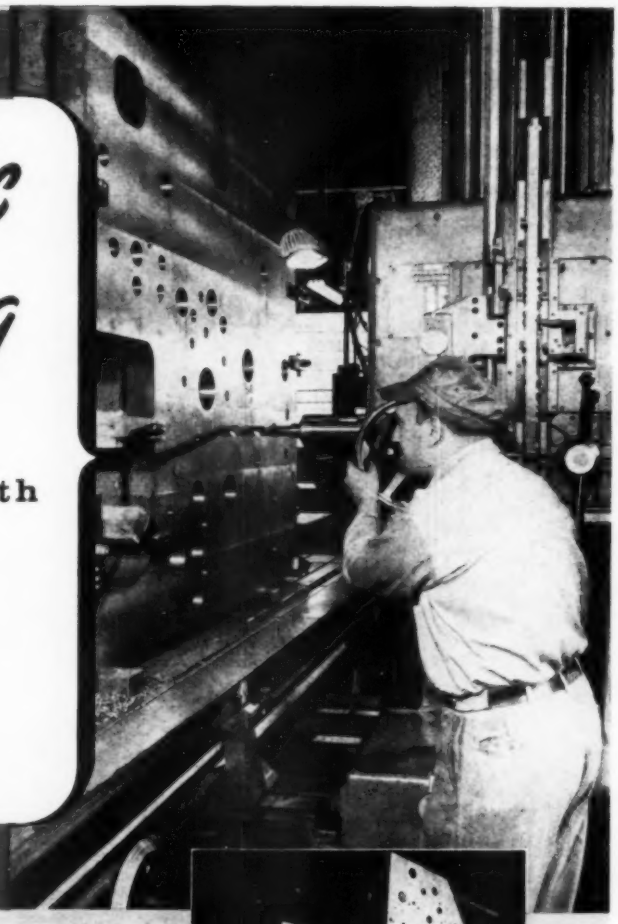
Reduces

Production Costs with

BULLARD

H.B.M.

MODEL 75



The experience of George Hantscho Company, Inc., Mount Vernon, New York, builders of equipment for the printing industry, is typical of that enjoyed by users of Bullard H.B.M., Model 75.

THE PROBLEM

To bore 105 holes, from 5" to ½" in diameter, in both side frames of paper folding machine to support rollers, gears and folding cylinders. Some holes must be aligned vertically and others horizontally.

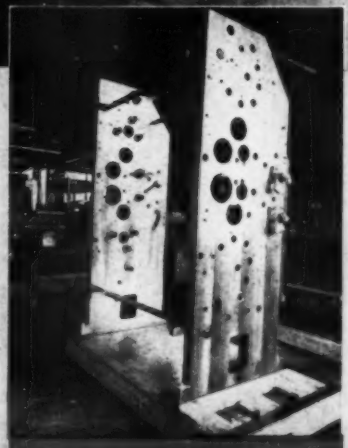
THE SOLUTION

Mount pair of side frames, 5⅛" apart, on table of 4" Bullard H.B.M., Model 75, equipped with automatic table and head positioning. Bore all holes of the same size beginning with the largest and working down to the smallest.

THE ADVANTAGES

All related holes in perfect alignment — no spoilage. Less tool change-over time.

Eliminate hand measurements and templates for hole location. Accurate automatic hole location within a tolerance of ±.0004". Ease of operation from Pendant Control — less operator fatigue. Overall boring time reduced 25% over previous method.

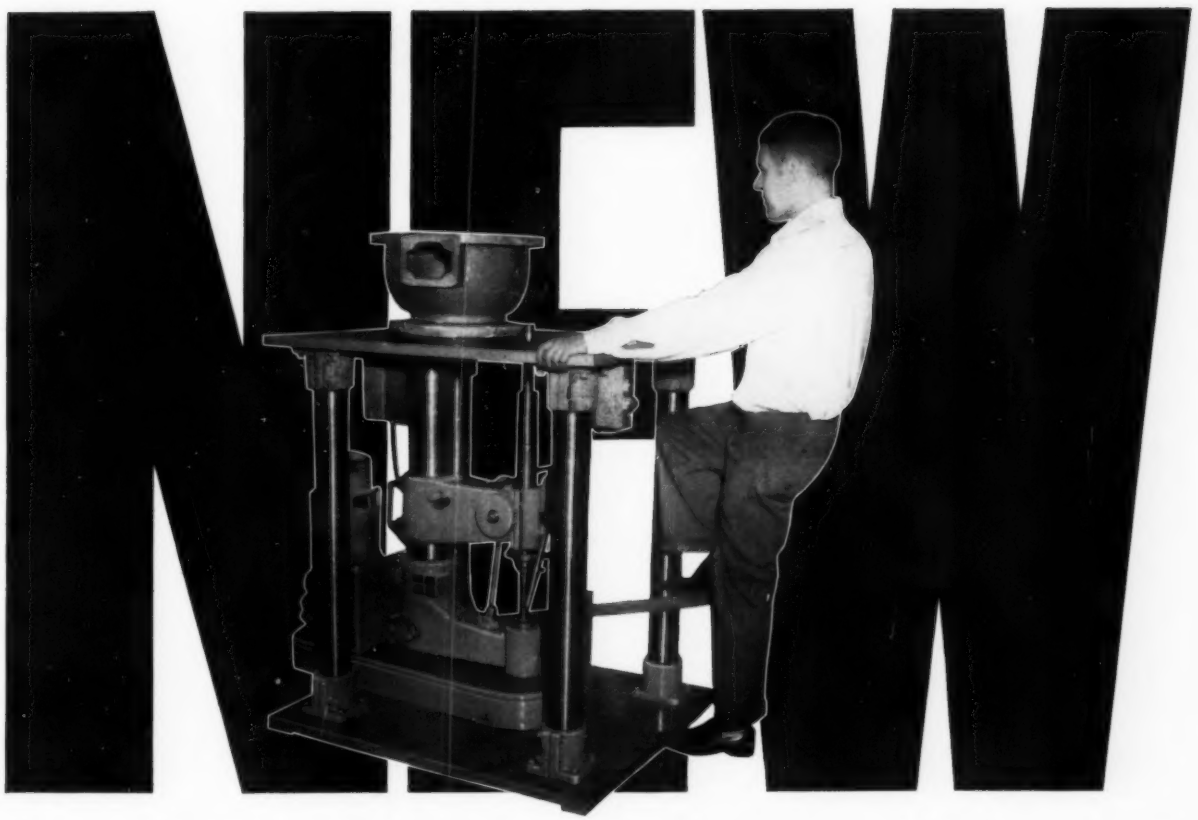


Partially assembled side frames ready for ink rollers, gears and printing cylinders.

How about your boring problems? Are you applying all the advantages of a Bullard H.B.M., Model 75 to them? If not — get the full story from your nearest Bullard Sales Engineer or write

THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT



"BUFFALO" BACK SPOT-FACER HANDLES 1000 LB. CASTINGS, AT PRODUCTION SPEED!

This heavy-duty "Buffalo" No. 22 Back Spot-facer is newly-designed for **fast** spot-facing of holes in flanges of large valve bodies, pump housings and other work pieces where it is impossible to spot-face a hole from the top. A rigid, ruggedly-constructed machine, it will spot-face to diameters up to 2½". Its large 36" x 43" table will handle castings weighing as much as 1000 pounds.

Three speed rates — 165, 255 and 400 rpm — are provided through a 2-HP, 350 rpm gear motor plus a C-section drive. The convenient foot treadle feed enables the operator to have both hands free to locate and hold the work. The spindle nose is bored for arbors with No. 4 Morse taper shanks, and the arbor can be locked in the spindle nose. Quarter turn, gunlock type cutters are recommended for use with this machine.

You can realize lower production costs with the "Buffalo" No. 22 Back Spot-facer. Contact your "Buffalo" machine tool dealer, or write for Bulletin 4078 today!

For Smaller Back Spot-Facing Operations on lighter castings, ask your "Buffalo" machine tool dealer about the "Buffalo" No. 18 Models A and B Back Spot-Facers. Or, write direct for Bulletin 3123.

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

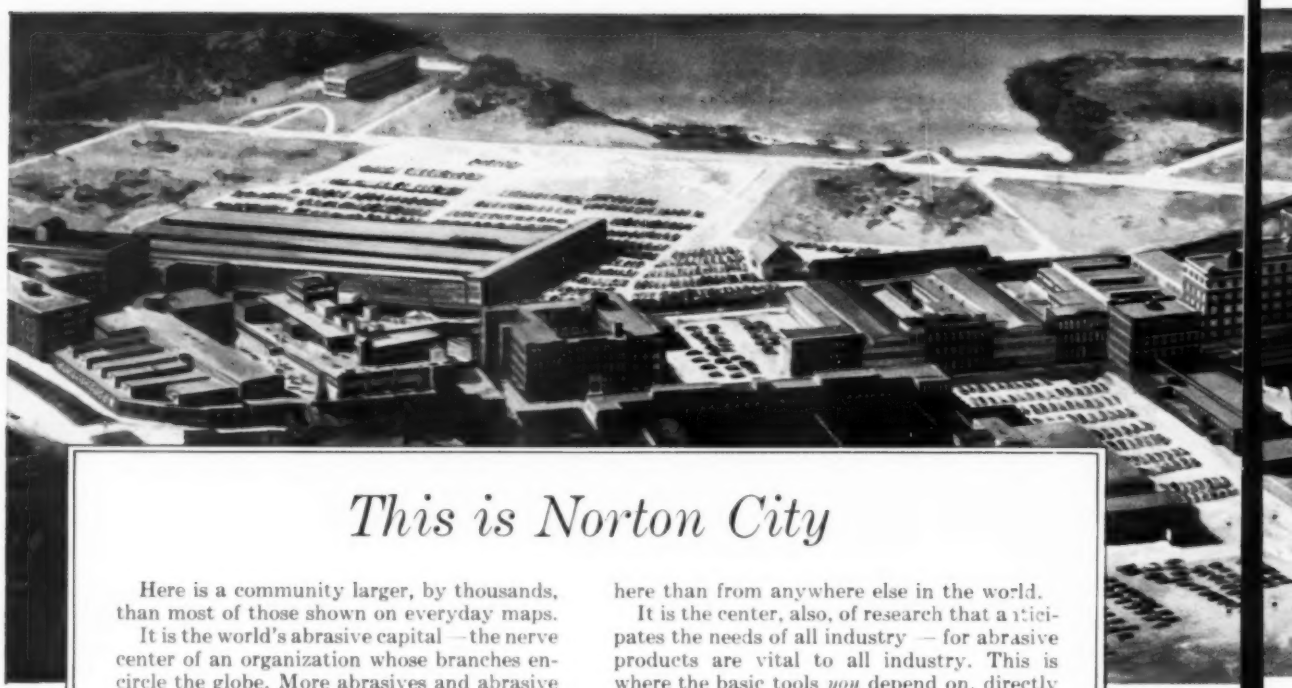
BUFFALO FORGE COMPANY

509 BROADWAY • BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING • PUNCHING • SHEARING • BENDING

CIRCLE 231 READER SERVICE CARD 32A



This is Norton City

Here is a community larger, by thousands, than most of those shown on everyday maps.

It is the world's abrasive capital — the nerve center of an organization whose branches encircle the globe. More abrasives and abrasive products are shipped from the many plants here than from anywhere else in the world.

It is the center, also, of research that anticipates the needs of all industry — for abrasive products are vital to all industry. This is where the basic tools *you* depend on, directly or indirectly, are made. *This is Norton City.*

Are there any bargains

There certainly are. But you can't evaluate a grinding wheel by its price alone. The only genuine bargains are wheels that bring steady economy to your grinding. You get them from Norton, with these advantages:

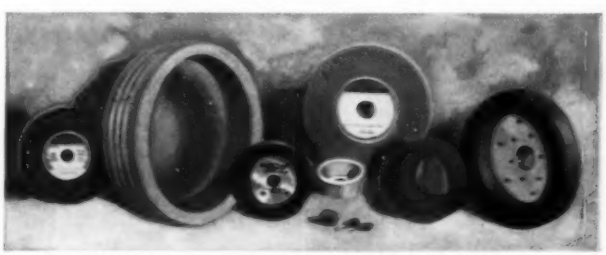
Top quality and top performance, resulting from Norton pioneering in research, engineering and manufacturing.

No delays in your production due to wheel variations, because Norton supplies you with precision-duplicated wheels . . . from complete warehouse and distributor stocks near you . . . meeting standard or special requirements with fast deliveries, regular or emergency.

Lowest cost per piece ground, aided by the product application experience of your Norton Abrasive Engineer . . . who is always ready to assist your production men in selecting exactly the right wheels you need to cut grinding costs.

Norton grinding wheels are your real, money-saving bargains — bringing you the "Touch of Gold" that increases product value and production profits.

NORTON COMPANY, General Offices, Worcester 6, Massachusetts. *Plants and distributors around the world.*

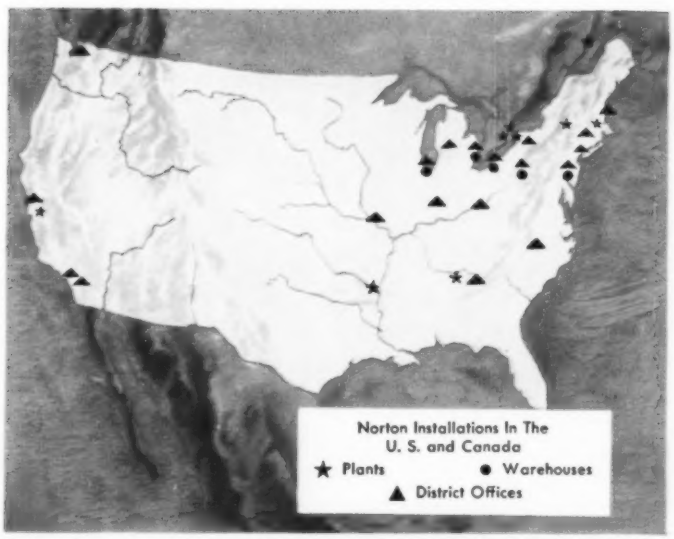


First in abrasives. Abrasives — in particular, Norton grinding wheels and Behr-Manning coated abrasives — are the principal Norton products. Included are all types of abrasives — diamonds among them — the most advanced bonding processes, and every wheel shape and size required by industry.

Making better products...

Main Office and Plant at Worcester, Massachusetts

in abrasives?

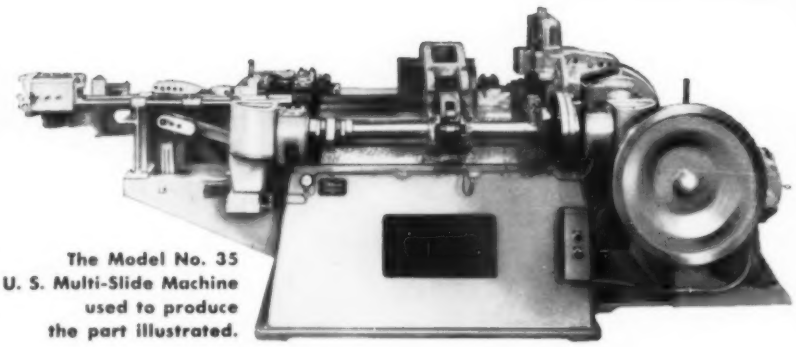


From coast to coast. Besides the Norton plants and warehouses and district offices indicated here, there is a Norton distributor convenient to every manufacturer in the U. S. A. Norton warehouses are located in important industrial centers. Abroad, Norton has plants in England, Northern Ireland, France, Germany, Italy, Australia, South Africa, Argentina and Brazil.

Processes. The first continuous tunnel kiln for processing grinding wheels was pioneered by Norton 30 years ago. This one is a recent Norton development. Used in the firing of grinding wheels, it provides closeness of quality control never before possible. Modern electronics guard quality continuously.

NORTON
ABRASIVES

to make your products better



The Model No. 35
U. S. Multi-Slide Machine
used to produce
the part illustrated.

U.S. MULTI-SLIDE® MACHINES ELIMINATE SECONDARY OPERATIONS

The cost saving potential of U. S. Multi-Slide Machines is, once more, demonstrated here in the economical production of a stamped automotive part.

By using the No. 35 U. S. Multi-Slide, the Production Metal Stamping Company of Toledo, Ohio is able to completely eliminate all secondary operations and handlings in the production of the formed stamping illustrated.

The No. 35 U. S. Multi-Slide produces this part in one operation. Cold rolled steel .059" thick by 3.210" wide is fed into the machine from coils and finished parts are produced at the rate of 85 per minute.

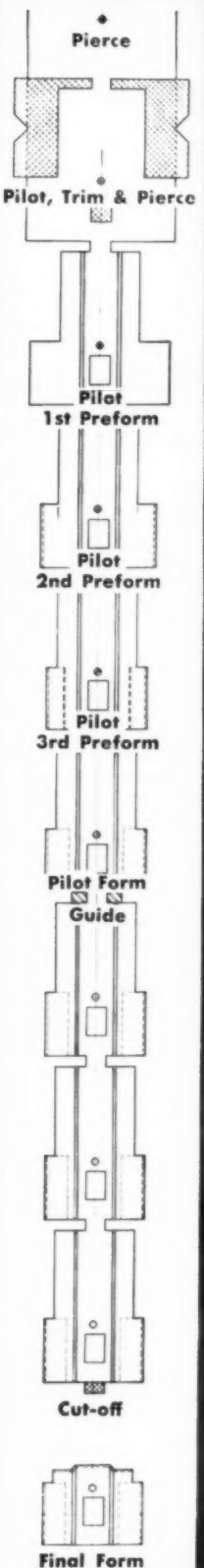
Each of the four models of U. S. Multi-Slide Machines is designed for the economical production of stampings. They are adaptable to the manufacture of wire parts as well as stampings from flat coil stock. In some instances more than one strip can be fed into a U. S. Multi-Slide for processing and completing an assembly. Prefabricated parts can be hoppered, positioned and assembled to the stampings being made while still in the machine. It is because of this versatility that the use of U. S. Multi-Slide Machines can considerably lower your component costs.

For the uniform, economical production of stampings — write for your copy of the U. S. Multi-Slide Bulletin No. 15-A — or send us your part drawings or samples for our recommendation.

MULTI-SLIDE

U. S. TOOL COMPANY, INC. AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

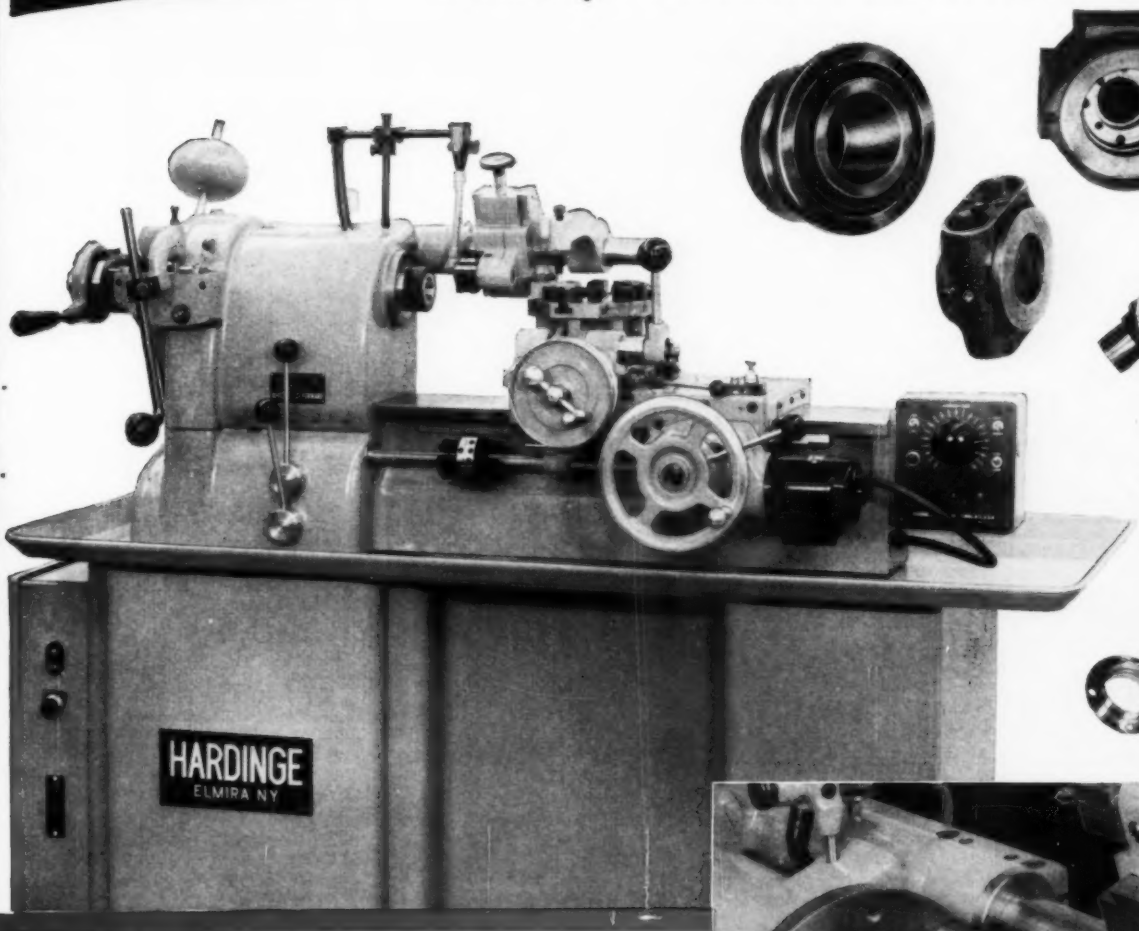


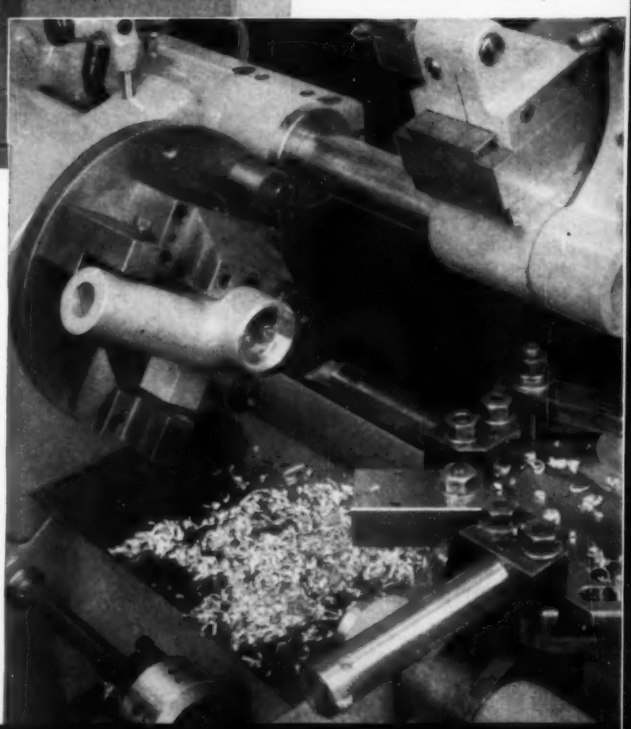
HARDINGE
ELMIRA, N.Y.

PRECISION CHUCKING MACHINE

Users say:

"We now get Production with Tool Room Accuracy"





Users enthusiastically tell us how they can easily maintain close tolerances, get better parts finish, and at the same time substantially cut costs . . . when they put Hardinge High Speed Precision Chucking Machines to work.

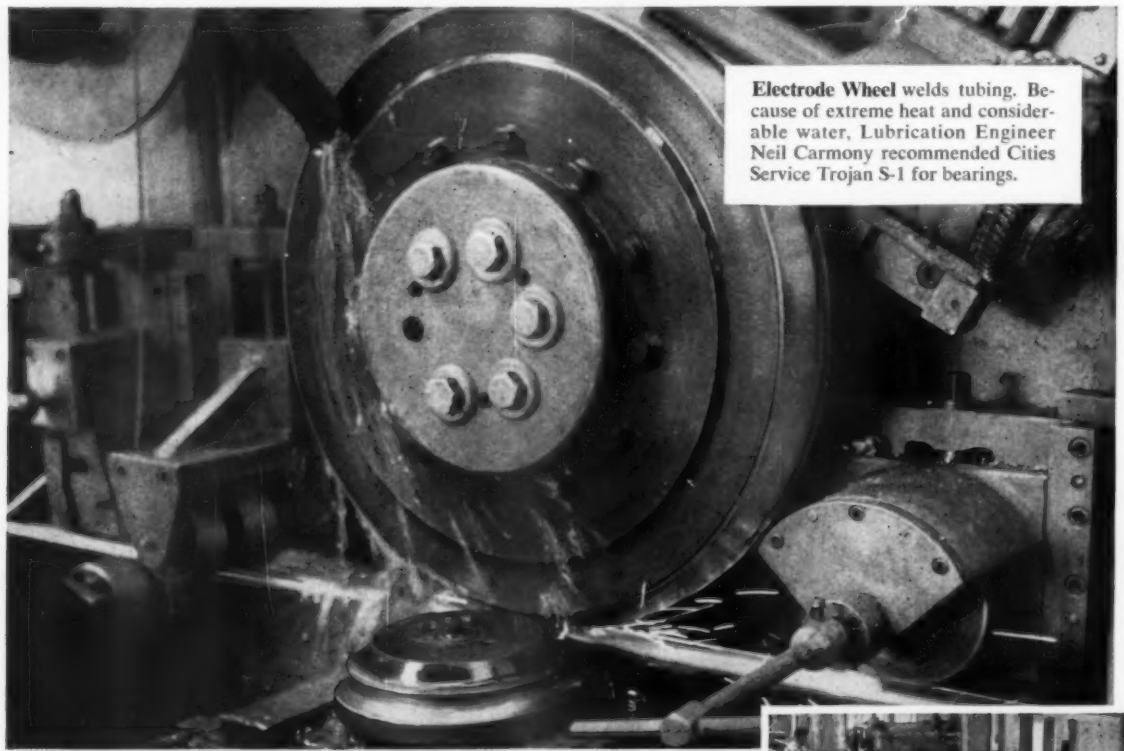
These results are possible because parts are finished in one setting with simplified tooling. All parts shown were produced with standard tool bits.

1 1/16" Collet Capacity— 6" Chucking Capacity— Write today for Bulletin HC-HCT which presents the whole story.

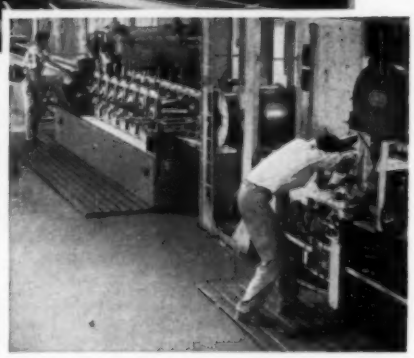
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

New Tubing Mill Produces at Speed of 350 Feet Per Minute!



Electrode Wheel welds tubing. Because of extreme heat and considerable water, Lubrication Engineer Neil Carmony recommended Cities Service Trojan S-1 for bearings.



It's Cities Service for Hydraulic System and all lubrication

On January 1, 1957, P&H Tube Corporation put a new mill in production at Bossier City, Louisiana—the only one of its kind in the United States.

Equipped with special drives and worm gears, this unique mill actually produces at the rate of 350 feet per minute—twice the speed of conventional tubing mills!

With speeds like this, you might expect lubrication troubles . . . but P&H Tube Corporation has none. One big reason is the careful study of each machine made by Cities Service Lubrication Engineer Neil Carmony—and the lubrication recommendations he made.

In hydraulic units, for example, Carmony recommended Pacemaker 200-T Hydraulic Oil . . . for he knew its ability to withstand the severest operating temperatures and speeds. He knew that due to its exceptionally high viscosity index and superior compounding, Pacemaker 200-T would give maximum resistance to thinning, oxidation, rust and corrosion.

The wisdom of this decision, as well as the choice of other lubricants shown in the chart at right, was demonstrated recently when P&H Tube Corporation ran off 125,000 feet of tubing in an ordinary eight hour shift—with normal time-out for change-overs!

That's production with a capital P! And if you'd like to improve your production picture, a Cities Service Lubrication Engineer can help you, too. Call the nearest office or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

What the Cities Service Lubrication Engineer Recommended

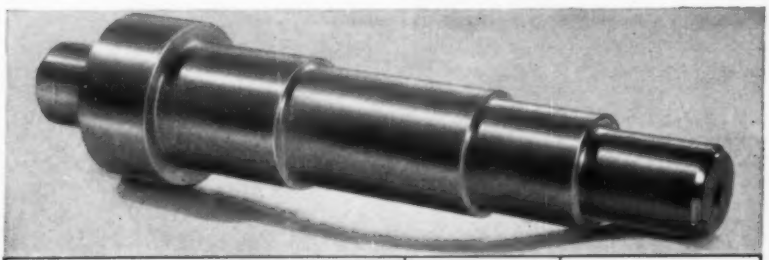
Hydraulic units	Pacemaker 200-T
Bearings	Trojan H-2 Grease
Drive units	Pacemaker Oils
Bearings by the mill's electrodes	Trojan S-1

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Production time reduced 82% on new lathe

New Barber-Colman 36-speed lathe does 13 operations on drive gear and shaft in 22.7 minutes



STANDARD TIME	OLD LATHE	NEW 36-SPEED LATHE
SETUP TIME (hours)	1.09	1.75
SPEEDS (rpm) FEED (inches per rev.)	350 .015	644 to 912 .013
PRODUCTION (per hour)	0.47	2.64

Turning time on the drive gear and shaft shown in the illustration was reduced from 126 minutes to 22.7 minutes when transferred from an old lathe to a new Barber-Colman 36-speed lathe.

The shaft is 15″ in length with a maximum diameter of 3.744″. Spindle speeds range from 644 rpm to 912 rpm, and the feed is .013″ per revolution. On the old lathe, speed was 350 rpm and the feed was .015″ per revolution. This is a good example of how machine horsepower, accuracy, rigidity, and operational features can reduce costs drastically.

Easy-to-set up Barber-Colman lathes combine power and precision for profitable optimum speed turning with negative-rake throwaway insert tools. They're heavier and wider through the carriage than most lathes of their size. Controls are "human engineered" to make a busy operator's job easier and more efficient. Yet they offer every toolroom feature you can name, plus guaranteed accuracy for precision work.

Opportunities in cost-cutting modernization

There'll never be a better time to buy a new lathe, or greater opportunities to reduce costs through equipment modernization. Here are two good reasons:

1. *Throwaway insert tools* are the biggest "break-through" in lathe "economics" in 30 years. Think of what it costs you to sharpen, change, and reset conventional tooling! Throwaway inserts make your perishable tool costs so low in relation to part costs and the cost of operating a machine, the only sensible thing to do is boost speeds, burn up tools faster, and reduce floor-to-floor time.

2. *It's the right time to buy machine tools,* because you can "pick and choose" — get the right machine and tooling for your assortment of jobs. The increase in productivity will prepare your plant for periods of high volume, spiraling costs, and labor shortages tomorrow.

Now in production in two sizes, these new machines will pull 25 hp through the spindle and operate at speeds up to 2000 rpm.

Barber-Colman Company
71 Loomis Street, Rockford, Illinois

Don't expect a day's work for a day's pay on yesterday's machine tools.

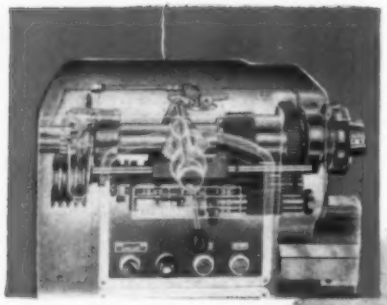
BARBER COLMAN®

PRECISION LATHES

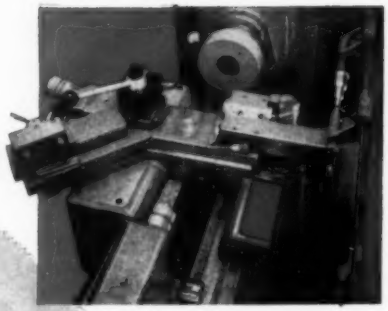
CIRCLE 237 READER SERVICE CARD

BIG

lathe features at low cost!



Full 5 HP—all spur gears—anti-friction bearings—automatic filtered lubrication—9 spindle speeds to 3000 RPM.



Compact, efficient 45° tracing mechanism—trouble-free, exclusive Lodge & Shipley design.

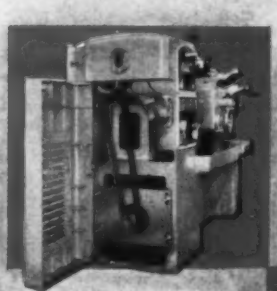
why pay $20,000 when you can buy a LODGE & SHIPLEY 1307 (10")

Hi-Turn COPYMATIC

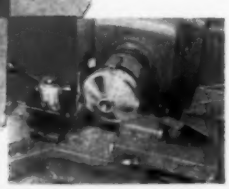
TRACER LATHE for less than $10,000?

Template-type multiple length stops for duplicating shoulder lengths.

Available with 3 spindle speed ranges or variable spindle speed drive, one center distance (20").



Easily accessible and adjustable drive with Dinabrake motor.



Simple set-up for contour facing operations.

The **HI-TURN 45° COPYMATIC Tracer Lathe** is extremely rugged, built to do production jobs at time and money-saving rates. You get Lodge & Shipley quality features at a price substantially below many lathes having less horsepower and light construction. If you perform manufacturing or tracer lathe operations, put them on a lathe built to do the job at lowest cost. The features shown here are but a few of many . . . for complete details, request Bulletin DM-4 from:

The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio

AVAILABLE NOW

from selected distributors

NICHOLSON HACKSAW AND BAND SAW BLADES

Nicholson Hacksaw and Band Saw Blades and Ground Flat Stock are now available through selected distributors.

The new full line of Nicholson Hacksaw Blades includes standard steel hand blades, and hand and power hacksaw blades in high-speed steel.

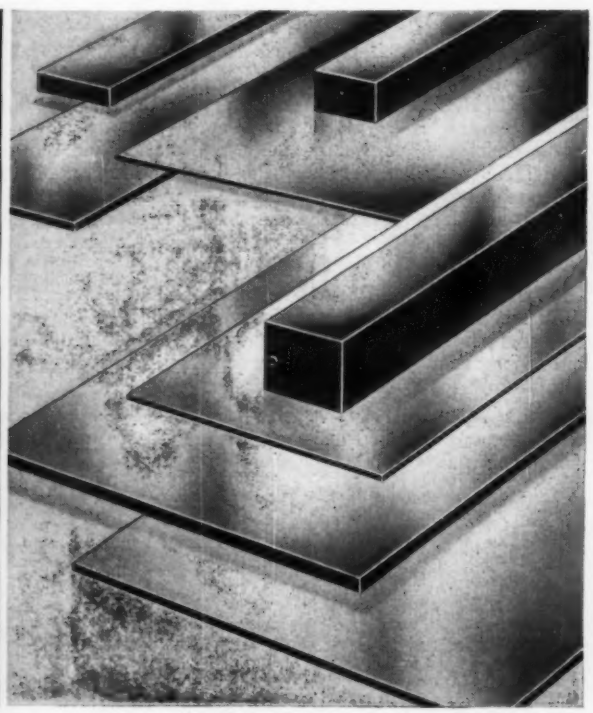
Our Band Saw Blades include a complete range of blades for general and specialized cutting. Every blade with the Nicholson trademark is designed and tested for performance perfection. You can rely on them for best results at lowest cost—just as you have always depended on files bearing our trademarks.

NICHOLSON GROUND FLAT STOCK

Nicholson precision-ground Flat Stock is available in over 1000 sizes of carefully annealed, expertly machined Stock in attractive, protective packages. Every Nicholson Flat Stock package bears the steel analysis and heat-treating procedure for its contents.

Ask your Industrial Distributor about these new Nicholson lines

Industrial Distributors provide the finest goods and services in the least possible time. Our products are sold exclusively through them.



NICHOLSON U.S.A.

NICHOLSON FILE COMPANY, PROVIDENCE, R.I.

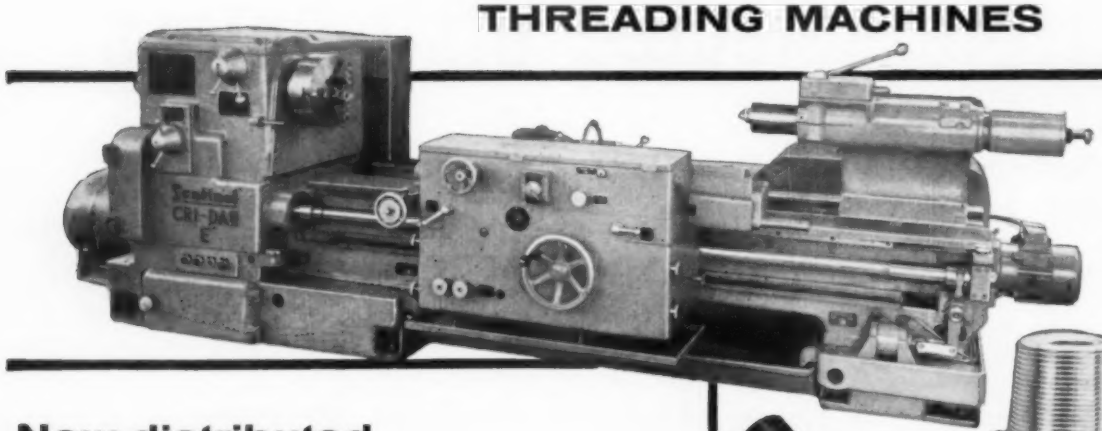
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

Announcing...

CRI-DAN

(Semi-Automatic Single Point)

THREADING MACHINES



Now distributed in the United States by GISHOLT

Widely used throughout Europe and rapidly gaining favor in the U.S.A., CRI-DAN High-Speed Threading Lathes offer outstanding advantages on a wide variety of threading work. Using single-point carbide tools and positive, cam-controlled movements, CRI-DAN provides very accurate lead and thread form on all types of internal and external threads, including multiple-start, coarse, fine, left- or right-hand, parallel or taper, with metric or inch pitches. Highest production, accuracy and fine finish are assured on even the most difficult materials.

With simple operation and 15 minute change-over, CRI-DAN is an extremely versatile machine capable of handling an amazing range of components at high production rates. Single-point carbide tools, easily resharpened or replaced, cut tooling costs to a minimum.

Two models are available with a full complement of accessories to meet your needs. Ask your Gisholt Representative for full details or write

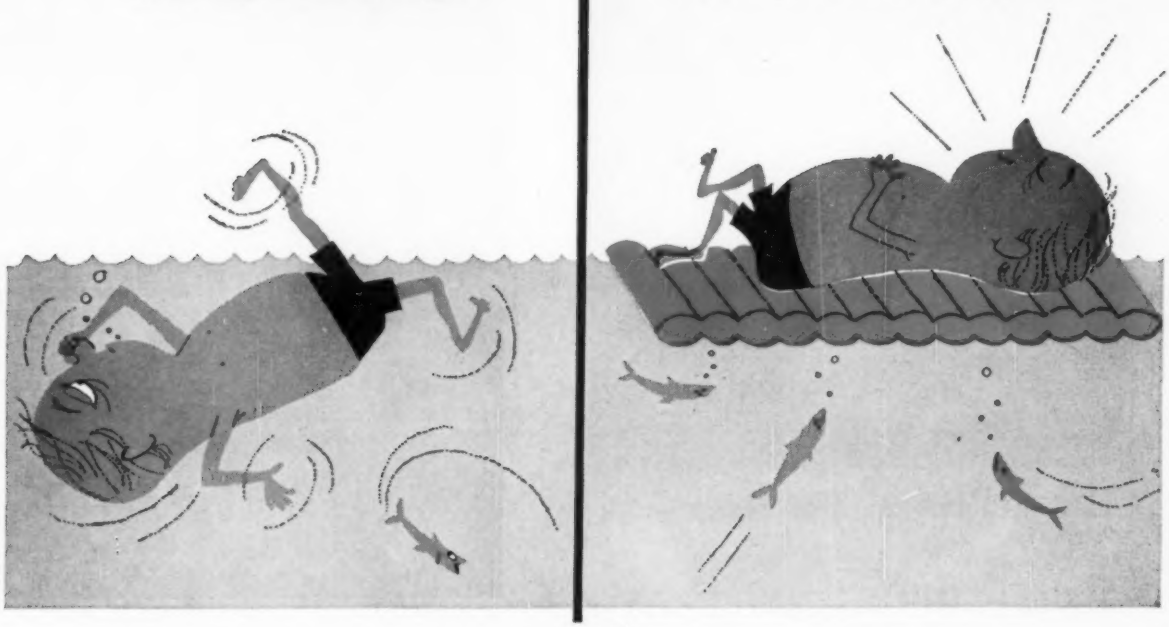
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers
Threading Machines • Packaging Machines
Masterglas Molded Plastic Products

Missing Something ?

The Answer is Pink!



Switch to PINK CIMCOOL

Stay on top of every situation with CIMCOOL° S2 Concentrate, world's largest selling chemical cutting fluid. Float along comfortably, sure that your cutting problems are cushioned by this radically new and different coolant. Switch to CIMCOOL and relax, because CIMCOOL does all this—

CIMCOOL LOWERS COSTS because it's longer lasting in machines. Therefore, it reduces downtime and cuts labor costs for cleaning and changing.

CIMCOOL PERMITS FASTER SPEEDS and feeds, because of its chemical lubricity. It combines friction reduction and cooling capacity in a degree never before attained by old fashioned lubricants.

CIMCOOL IS CLEANER TO USE because it doesn't soil hands or clothing. It contains no skin irritants. And it's safer because it leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn and virtually eliminates rancidity and foul odors.

So *swim* with the tide of people who are switching to CIMCOOL. Call your CIMCOOL Distributor today. He'll be glad to give you full information on all the advantages of CIMCOOL concentrate—as well as details on the entire family of CIMCOOL Cutting Fluids. Or contact us direct and we'll have one of our Cincinnati Milling Machine trained machinists call on you—without cost or obligation, of course. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

CIMCOOL CUTTING FLUIDS

CIMCOOL **S2 Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMPLUS—The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Concentrates (AA, NC, SS)**—For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

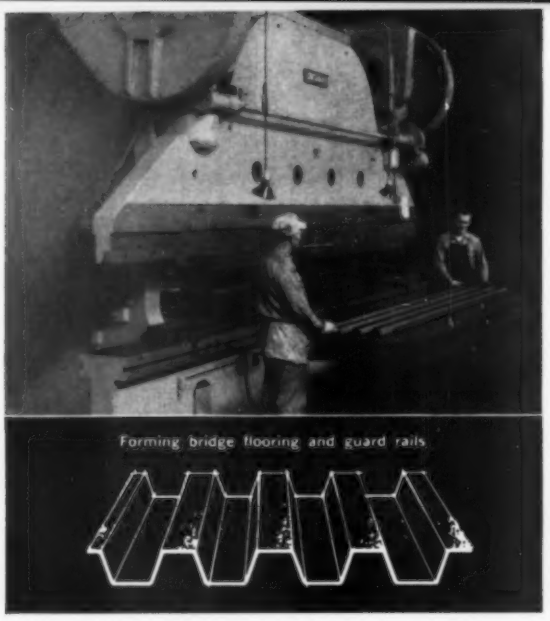
CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

Also, CIMCOOL Bactericide and CIMCOOL Machine Cleaner.

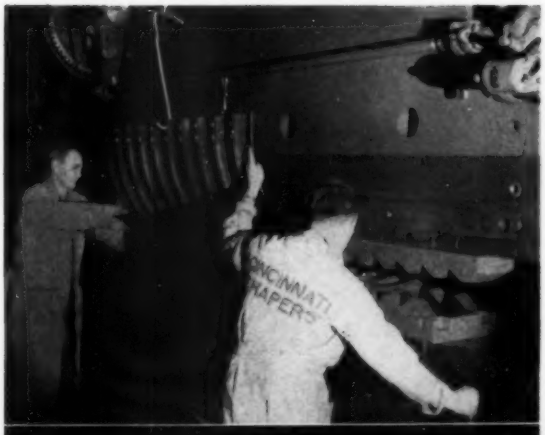
for 100% of all metal cutting jobs. The Answer is Pink!

Production-proved products of The Cincinnati Milling Machine Co.

° Trade Mark Reg. U.S. Pat. Off.

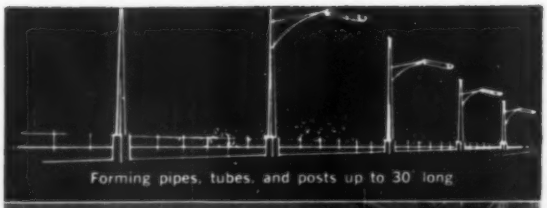


Forming bridge flooring and guard rails

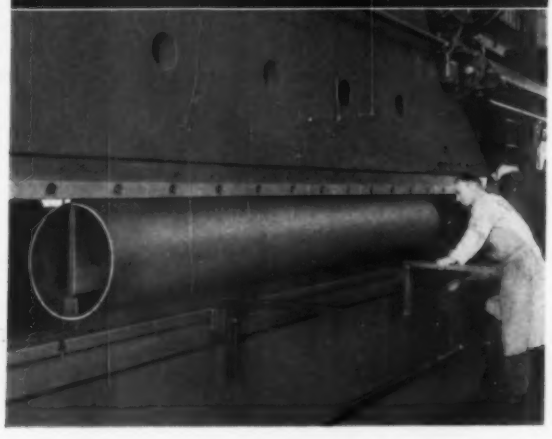


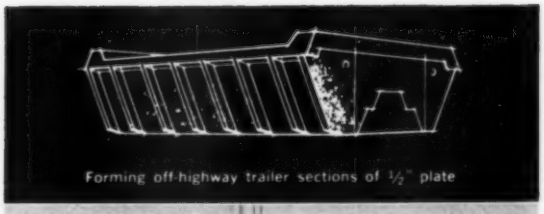
Forming culvert sections which have been punched and corrugated

Tool up with Cincinnati® for

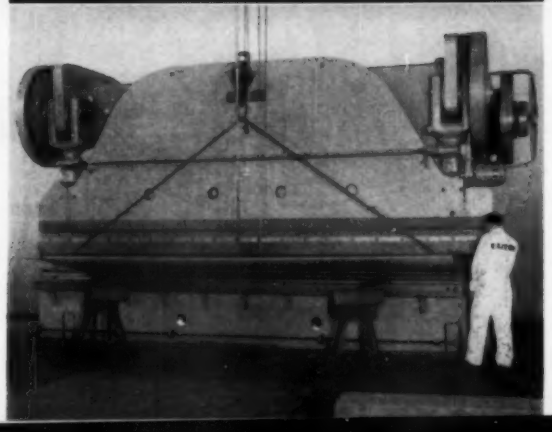


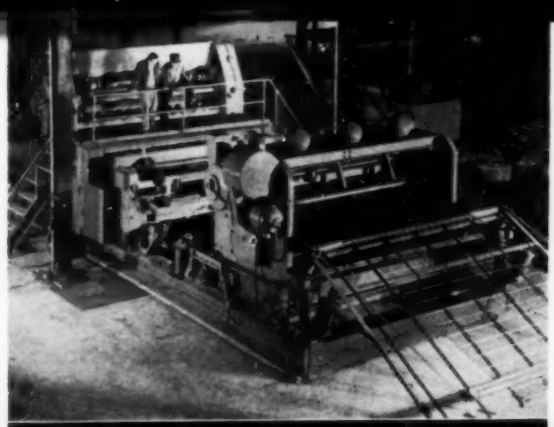
Forming pipes, tubes, and posts up to 30' long



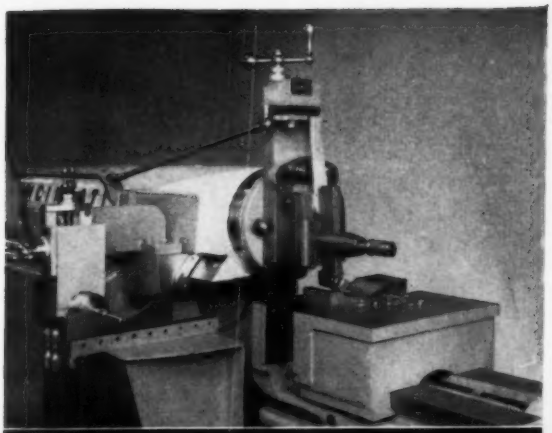


Forming off-highway trailer sections of ½" plate



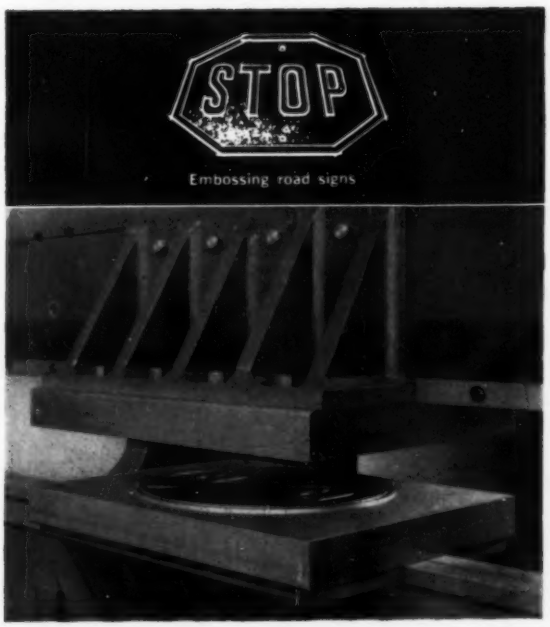


Automatically shearing welded steel road mesh



Shaping bridge pillow blocks quickly, accurately

America's huge road program



Embossing road signs

Here are just a few of the many jobs now being done profitably on Cincinnati® Shears, Press Brakes, and Shapers—helping to build America's highways.

Your share of the profits from this vast highway program will depend on your ability to supply metal components on time, in sufficient volume, to specifications, and at competitive prices. Whether you make guard rails or bridges, lampposts or culverts, curb forms or earthmovers—now is the time to measure your shear, press brake, and shaper capacity against the demand coming down the road.

Don't wait for competitive traffic. Write Department A for more data on these Cincinnati applications: Catalog B-5 on Press Brakes; Catalog S-7R on Shears.

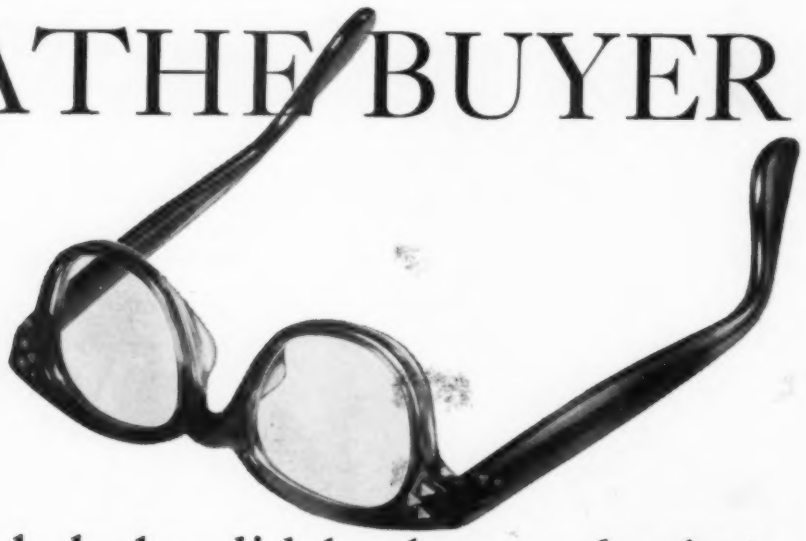
Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

CIRCLE 243 READER SERVICE CARD

The CASE OF THE DISCERNING LATHE BUYER



Which lathe did he buy and why?

Mr. Elwood Brandenburg,

Factory Superintendent of the Liberty Tool & Die Corporation, Rochester, N. Y., recently made a buying decision. His company, a well known manufacturer of precision tools, dies and special machines, needed a 16" toolroom lathe for precision work. He wanted versatility, stamina, rigidity and operator convenience . . . and, like all of us, he wanted to make a good buy pricewise. Here's how he made his decision. Can you identify the machines?

The ones he rejected...

"Beautiful machine . . .
but too many gadgets I won't use.
Price too high."

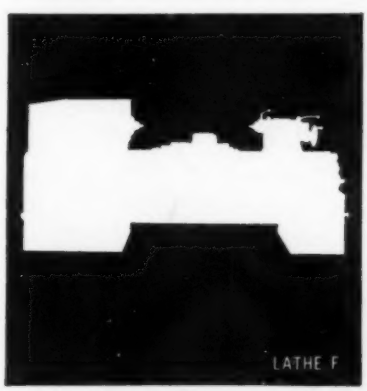
"Same lathe as pre-War
No improvements.
Looks like our old machines."

"Only began making toolroom
lathes since the War. Had none
in the area to demonstrate."

"Meets specifications,
but too light-weight and we felt
that low price was not the best value."

"These people only make a 16" lathe now.
Can't help but wonder if they're
going out of the lathe business."

And the one he chose...



"All things considered, 4 points won me over:

1. "*Replaceable* hardened tool steel bedways . . . can't help but feel safer knowing if anything would happen to these basic precision components, they can be quickly replaced as good as new."

2. "Compensating veeway bed design . . . On some of my bigger machines the carriage always rides up off the ways when making a hogging cut. The compensating veeway design distributes forces so this can't happen."

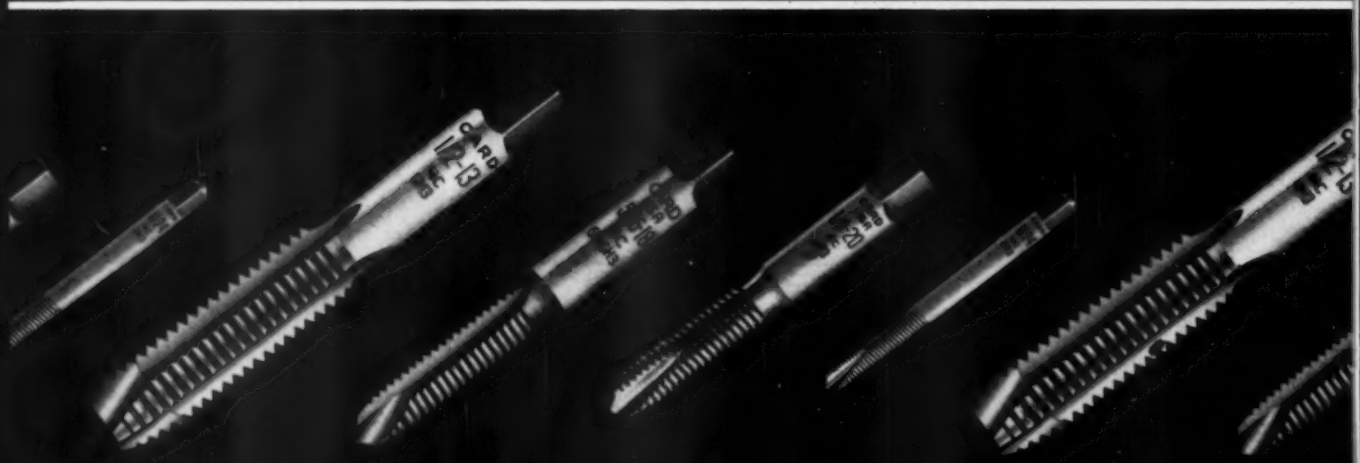
3. "Two-speed tailstock . . . here's a feature that I can really use. It's especially useful for drilling and makes set-up easier, eliminates the bull work."

4. "New design headstock with compensating bearing enables us to use ceramic tooling."

"Those were the *facts* that swayed me over, but there was one other thing . . . call it an 'intangible.' The salesman. Lathe F's representative honestly acted as though he would like to sell me a machine. He was helpful as he could be. He took me to a nearby plant to see his machine in operation. Then, when I asked for the old hard sell . . . he had all the answers. Yes sir, the salesman *is* a factor."

for Mr. Brandenburg's decision, turn to page 182

As these desk phones are uniform



. . . So Card spiral pointed taps are uniform, too

Your production's consistent ...because Card taps are uniform

Your first step in consistent production performance is the cutting tool itself. Because Card spiral pointed taps are identical they keep production up to par — and predictable. Shopmen know about the uniformity of Card taps. Card gages are like that, too.

S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

The CARD Quality

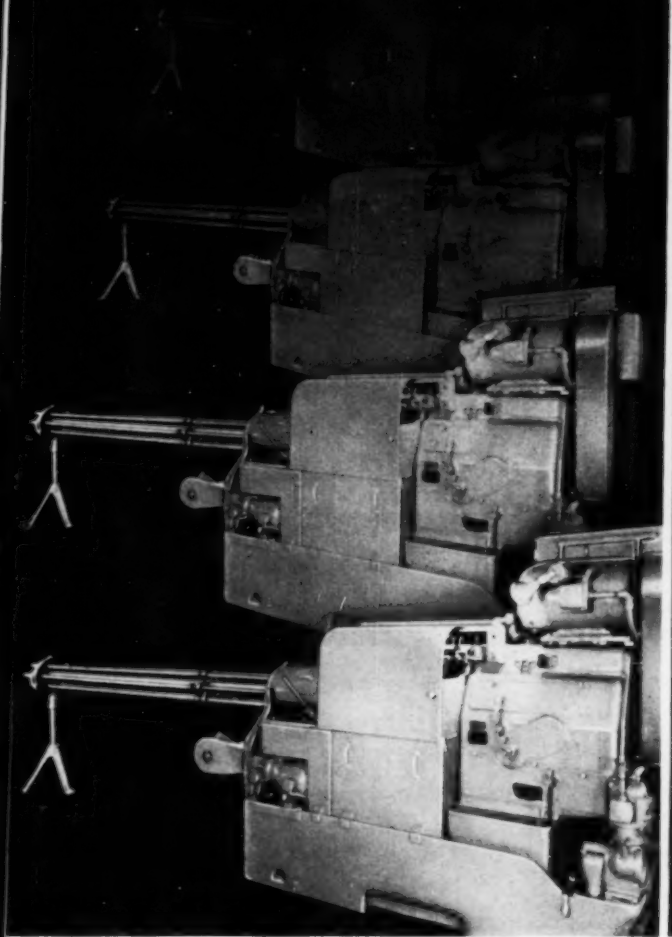
CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through the best distributors from Coast to Coast

CIRCLE 246 READER SERVICE CARD

If you use reamers as much as screw machines use bar stock...



This brand cuts down your reamer usage, production time and costs!

The more you use reamers – high speed steel or carbide –

the more you need Union

Union reamers, high speed steel or carbide, are all alike in one feature. Their consistent top quality reduces your production costs and improves your production quality. Union also manufactures drills, milling cutters, gear cutters, end mills, hobs and inserted blade cutters.

Available nationally through Union Distributors and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

UNION

TWIST DRILL COMPANY, Athol, Massachusetts

S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

CIRCLE 247 READER SERVICE CARD

NOW...from MUELLER cold·prest® IMPACT

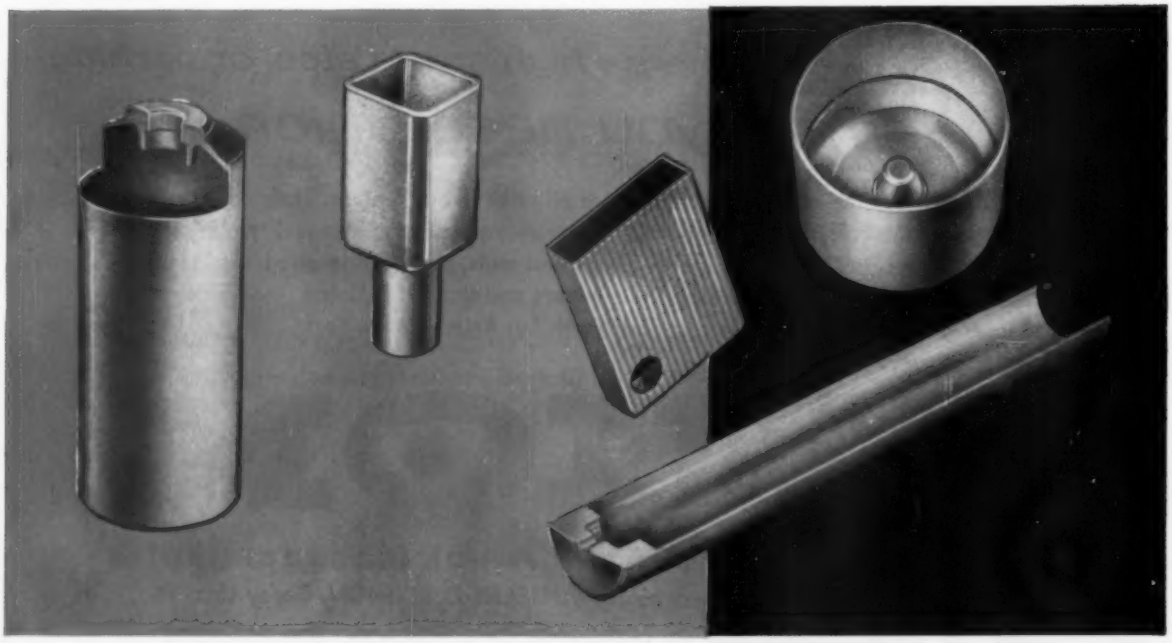
the amazing, new, chipless metalworking method that cuts production costs... ....improves part quality

Cold-Prest Impact Extrusions are here. This amazing new method of producing parts to closer tolerances . . . with better physical characteristics, and with absolutely no waste and at extemely high speed is the greatest development in metal-working in the last 20 years. And it's proving to be the most practical method of manufacturing a staggering number of designs that combine cold forged bases with shells shaped as rounds, ovals or rectangles.

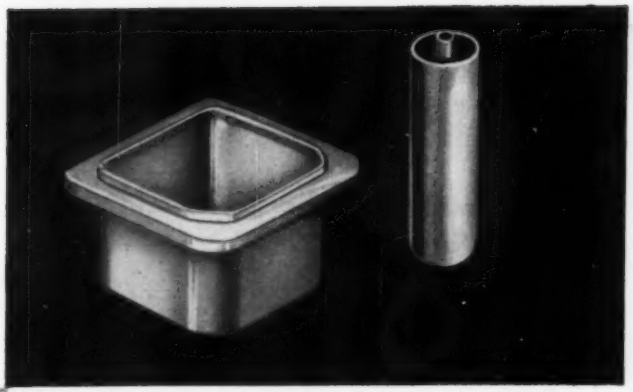
Here are some of the reasons why your company can save money and improve product quality . . . by specifying Mueller Brass Co. Cold-Prest Impact Extrusions. Parts are formed with *no chip loss;* you pay only for the metal that goes into the part. Because of the dimensional accuracy of Cold-Prest extrusions, parts can be held to closer tolerances and many costly secondary machining operations are eliminated. They have better physical properties with actually less metal needed to achieve greater strength.

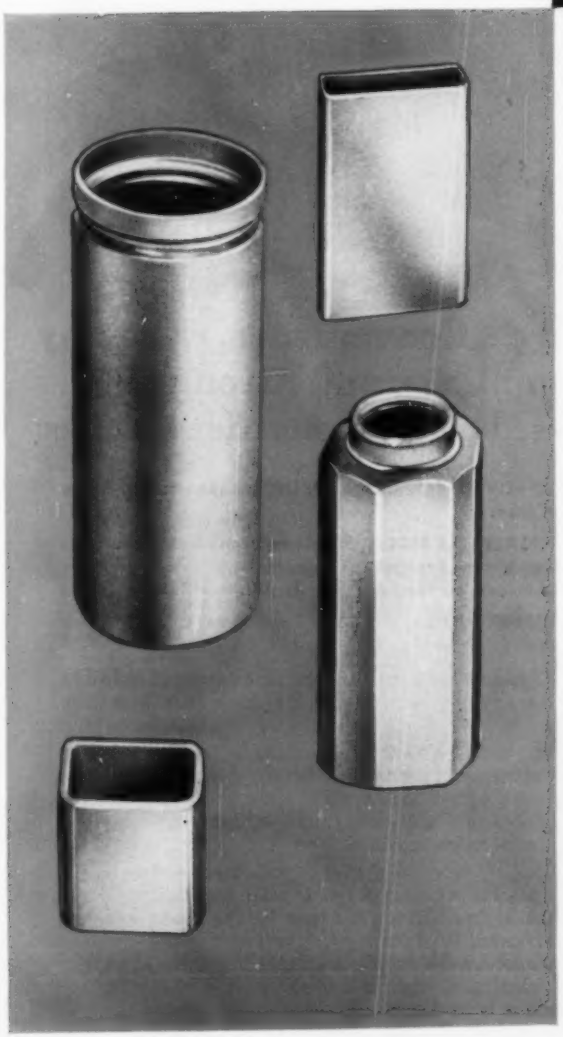
Cold-Prest Impact extruded parts often *reduce or eliminate assembly operations* because products employing several parts can often be made as a single extrusion. Also, complex parts produced by conventional methods requiring costly machining to close tolerances can be made in *A SINGLE OPERATION* as a Cold-Prest extrusion, saving raw material, costs of time, tools and labor . . . as well as assuring a positive leak-proof part.

These are the outstanding reasons why you should consider Cold-Prest Extrusions when you are specifying and purchasing fabricated metal parts. Call a Sales Engineer from the Mueller Brass Co. . . . he will be glad to discuss your problems and answer your questions. Write today for our new 16 page engineering manual on "Cold-Prest Impact Extrusions".



BRASS CO.
EXTRUSIONS





MUELLER BRASS CO. SERVICES mean better designed, better engineered, lower cost cold-prest extruded parts

To produce precision, high quality impact extrusions, Mueller Brass Co. combines all the important factors of design, engineering and production in its Cold-Prest extrusion process. Trained engineers take into consideration such elements as functional strength, finished appearance and proper control of metal flow. Mueller Brass Co. offers this design engineering service to its customers, and engineers are always available for consultation.

Here a die and punch assembly, made to exacting tolerances and with a mirror-like finish, receives a final inspection in the tool and die shop before being sent to the production department. Skilled craftsmen work with the best equipment available to produce these precision tools and dies. Technical skill, modern equipment and complete engineering services are available at no extra cost to you.

MUELLER BRASS CO.

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

259

PORT HURON 24, MICHIGAN

New ARMSTRONG

Armide CARBIDE INSERT TOOL HOLDERS

Buy ARMSTRONG TOOLS from your Industrial Distributor

Write for catalog

Embody...Convenience, Economy Simplicity and Strength based on these superior features:

- **IMPROVED CLAMPING METHOD—speeds indexing of Inserts.**
- **REPLACEABLE SEAT of Hardened Tool Steel—protects shank and provides flat base to prevent damage to inserts as they are clamped in position.**
- **SHANK of Heat Treated Alloy Steel—gives extra strength and rigidity.**

A slight turn of a single screw permits rapid indexing of the ARMIDE insert—reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts—triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

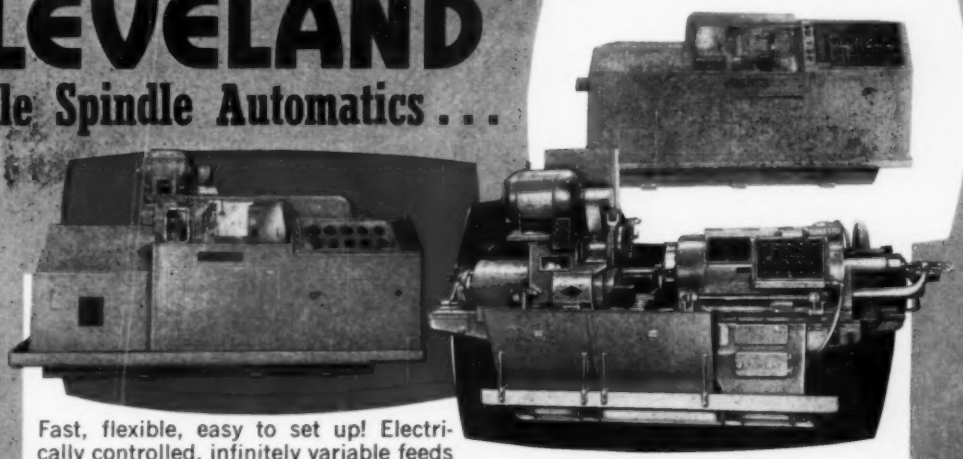
ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

ARMSTRONG BROS. TOOL CO.

5215 W. ARMSTRONG AVENUE **CHICAGO 46, ILL.**

CLEVELAND

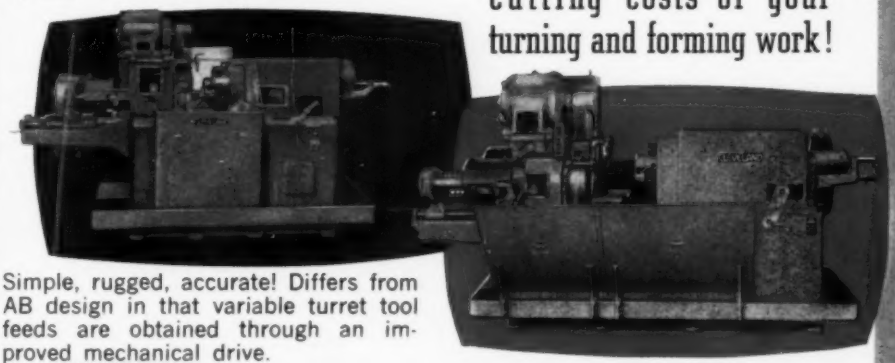
Single Spindle Automatics . . .



MODEL AB
DIALMATICS
Capacities:
1⅜", 1⅝", 3", 4¼", 5¾".

Fast, flexible, easy to set up! Electrically controlled, infinitely variable feeds are set by turning dials. On 1⅜" and 1⅝" sizes, turret feeds **and** spindle speeds are electrically controlled.

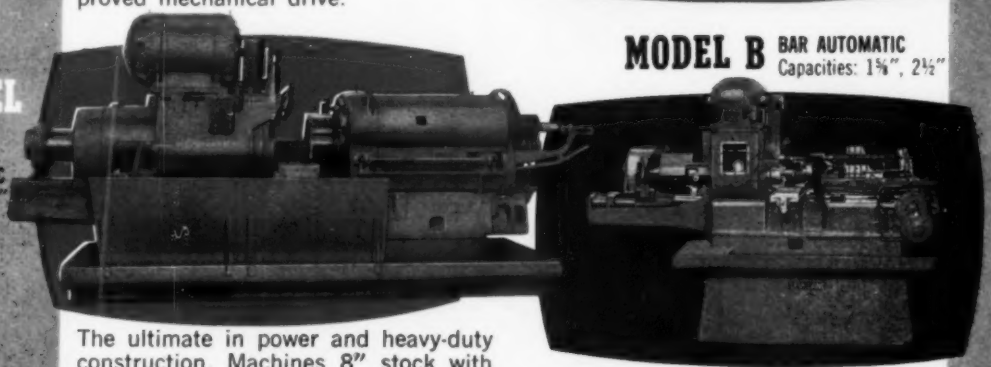
each a champion in cutting costs of your turning and forming work!



MODEL AW
AUTOMATICS
Capacities:
2½", 4¼", 5¾"

Simple, rugged, accurate! Differs from AB design in that variable turret tool feeds are obtained through an improved mechanical drive.

MODEL B BAR AUTOMATIC
Capacities: 1¾", 2½"



MODEL A
AUTOMATIC
Capacity: 8"

The ultimate in power and heavy-duty construction. Machines 8" stock with ease and accuracy. Universal camming saves set-up time.

For detailed information on Cleveland Automatics call a Cleveland sales engineer or write for new General Bulletin.

Tooling is mounted on a flat milling slide and on two cross slides. Ideal for work involving multiple diameters, shoulders, etc. Model B-18" handles work to 18" long.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

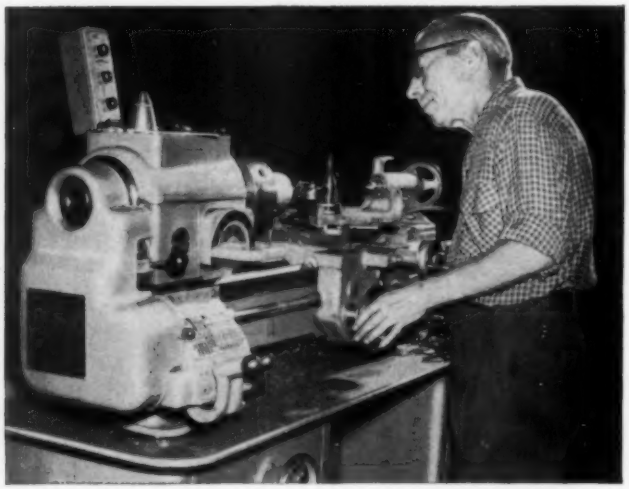
4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

DELTA INDUSTRIAL

DELTA 20" DRILL PRESSES are built to give you machine tool production capacity with power tool flexibility. Massive construction and rugged power make the Delta 20" a heavy-duty tool. Available with hand or power feed, choice of No. 2 or No. 3 Morse taper spindle. 28 models include floor, bench, multiple spindle and overhead types. Production tables, heads and columns available as components.



DELTA 11" METAL LATHES offer exclusive Delta Quality features such as massive head stock construction, perfected variable speed drive, unique 4-position drive selector and many more. Both 4 ft. and 5 ft. bed models available with flame hardened bed. And you get the double versatility of a ram-type turret lathe, when you add production accessories for precision multiple machining jobs.

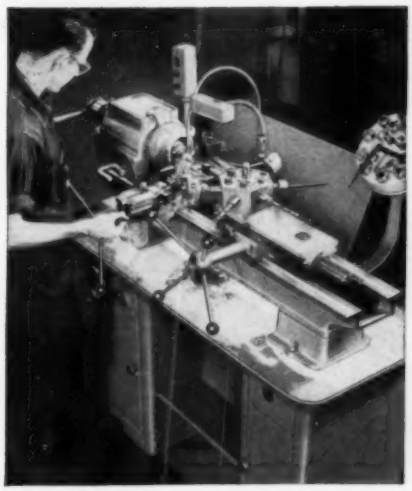
A proved way to cut your costs

DELTA 17" DRILL PRESSES in over 70 models enable you to make your own single or multiple spindle set-up for drilling, counterboring, reaming and tapping jobs. Finest in their class, they are engineered for precision work and built for long life with low maintenance costs. Standard or power feed, high or slo speed and key chuck or tapered spindle available in floor, bench and multiple spindle models.

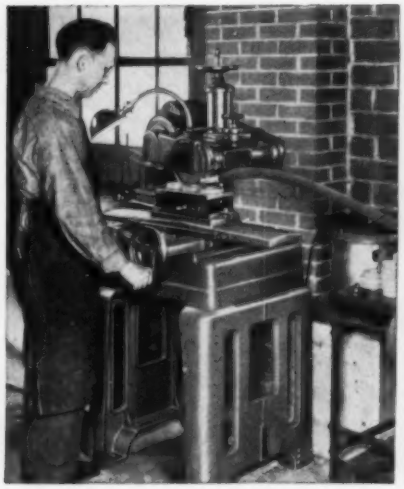
DELTA CUT-OFF MACHINES for fast, smooth, accurate cuts are speeding production and improving quality in tool rooms, maintenance departments and on production lines. Work head pivots for easy mitering. All belts, pulleys, cutting wheels or blades are fully enclosed for maximum safety. Whether you do wet abrasive or dry abrasive cutting, or cut non-ferrous metals or wood—you choose the model that's right for your job.

CIRCLE 252 READER SERVICE CARD

PRODUCTION TOOLING



DELTA HAND SCREW MACHINES fill the production gap between standard engine lathes and expensive, automatic screw machines . . . and at lower cost than any comparable machine. Bed turret, double tool post cross slide and lever type collet closer are *standard equipment*. Delta Quality features throughout assure lasting precision on multiple machining jobs.



DELTA TOOLMAKER® GRINDERS perform three precision grinding operations—surface, chip breaker and tool and cutter grinding. And with Delta 6" tool grinders, 7" standard grinders and 2½" belt grinders you have a complete line of safe, accurate, low cost grinders for every shop need.

DELTA 14" BAND SAWS These versatile, low cost machines give you eight cutting speeds—ranging from 40 fpm for metal to 3000 fpm for wood—using a *standard* motor. They enable you to cut stainless steel, armor plate, high speed steel, cast iron, alloy steel and dozens of other materials including woods and plastics. Available with steel or cast iron stand.

on every metalworking job

DELTA 15" DRILL PRESSES offer such Delta exclusives as six spindle adapters, "universal" hand feed, counterbalanced belt guard . . . plus big, machine tool ruggedness and proven production dependability. Delta 14" utility and 14" Super-Hi Sensitive Drill Presses also available in many models.

Thousands of metalworking plants across the country are cutting costs by using Delta Industrial Tools to supplement or replace expensive, special-purpose machines. Here's why: Delta tools are ruggedly built to withstand hard, continuous wear—they offer precision performance to meet the highest production standards—yet they cost less to buy, less to operate, and less to maintain. Completely portable, Delta tools can be moved in and out of production lines to relieve bottlenecks. And any plant can have inexpensive, automated operations through the combination of versatile, standard Delta components and automatic control devices.

Because Delta is the world's most *complete* line, you can choose the *right* tools for the biggest savings on *your* jobs.

Get all the facts on how YOU can cut costs with Delta Industrial Production Tooling. Write for FREE Delta Industrial Catalog to: Rockwell Manufacturing Co., Delta Power Tool Div., 618-J N. Lexington Ave., Pittsburgh 8, Pa.

See Delta Industrial Tools at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

DELTA INDUSTRIAL TOOLS

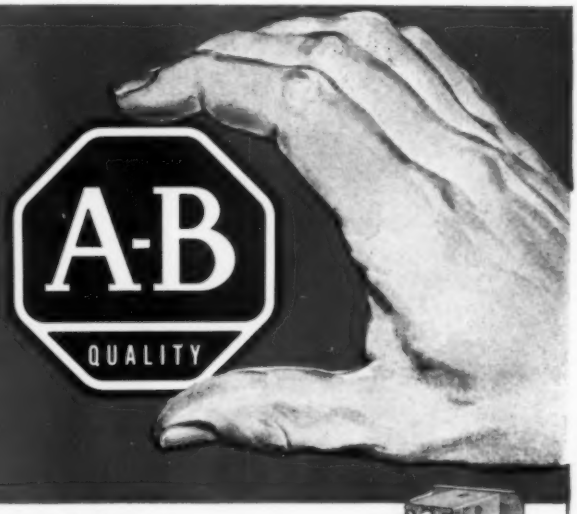
another fine product by

ROCKWELL

CIRCLE 253 READER SERVICE CARD

AMONG DESIGN ENGINEERS . . . ALLEN-BRADLEY IS THE PREFERRED CONTROL!

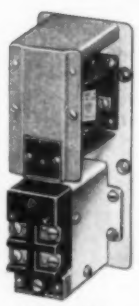
THE "SIGN" OF trouble free TIMING RELAYS!

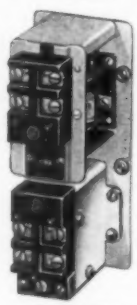


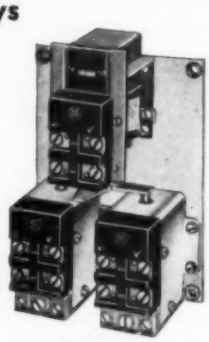
Pneumatic Timing Relays

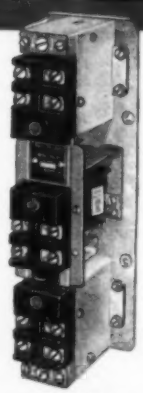
BULLETIN 849

These versatile timing relays are available in a variety of types for either "on delay" or "off delay." Delay time is adjustable from 1/20 to 180 seconds with an accuracy of ± 10%. Maintenance free silver alloy contacts. Additional auxiliary contacts easily added. A.C. or D.C. operation.

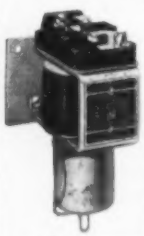

STANDARD UNIT


AUXILIARY CONTACTS ADDED


TWO TIMING UNITS


COMBINED ON-OFF TIMER

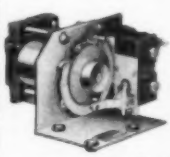
Fluid Dashpot Timing Relays



BULLETIN 848

For applications where reliability is more important than accuracy. As the viscosity of the silicone fluid does not vary with temperature, the timer's accuracy is ± 15% from −30°F to +120°F. Can be easily adjusted from 2 to 30 seconds.

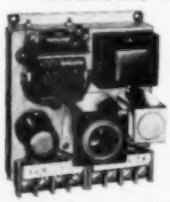
Motor Driven Timing Relays



BULLETIN 850

Driven by a Telechron motor, this timer alternately opens and closes two switch units. Made to provide 2, 3, 4, or 6 operations per minute on 60 cycles. Running and drift time on both contact units are easily adjustable.

Electronic Timing Relays



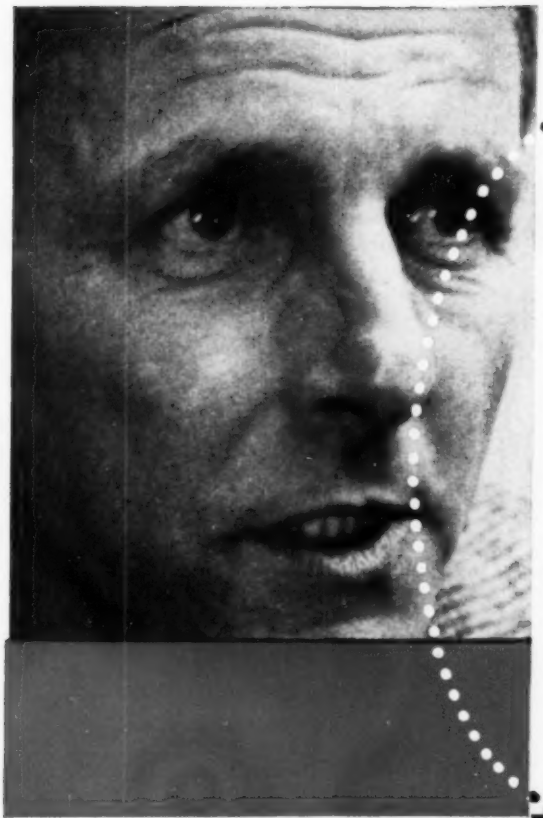
BULLETIN 852

An accurate and flexible A.C. timer, designed for frequent operation. Can be recycled rapidly over long periods. Time delay is dial adjustable over a range of 20 to 1. Repetitive accuracy ± 2%. Eight units provide time delay of 0.025 to 120 seconds.

This broad line of timing relays carries the traditional Allen-Bradley trademark of *quality* that stands for trouble free operation. The rugged construction and maintenance free, silver alloy contacts have made them first choice among men in the field . . . engineers, consultants, and contractors. You just cannot go wrong when you specify Allen-Bradley control . . . by name!

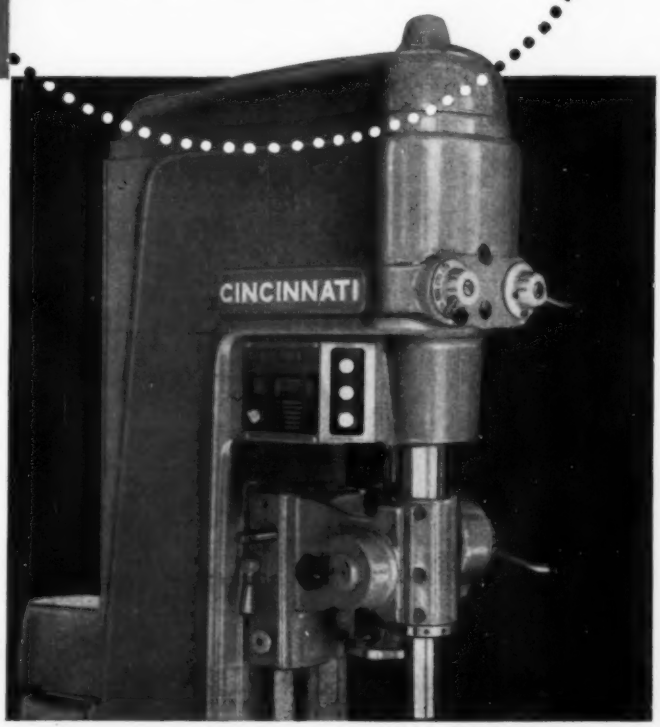
Allen-Bradley Co., 1310 Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY



"I'll pay for this drill only **once**...it costs less to buy accuracy **before** installation!

I pay for quality and accuracy at the start, then make my savings through lower costs per job. And, it's much easier to get jobs when costs aren't loaded with a lot of expensive down-time and rehandling."



It's a better buy... right across the production board!

CINCINNATI-quality...

GENERAL PURPOSE Royal Drills—16″ size with ⅝″ capacity, 18″ with 1″ capacity. Standard bench and floor models, and production bench types.

SLIDING HEAD Drills—16″ and 24″ Medium Duty bench and floor types with 1″ capacity; 21″ and 25″ Heavy Duty floor type with 1½″ capacity. Conventional drive, or INFISPEED variable speed drive.

STATIONARY HEAD Drill—Economical 21″ floor model with 1½″ capacity.

RADIAL Drill—3′ Arm 7½″ Column model with 1¼″ capacity. HARDCLAD® flame-hardened column.

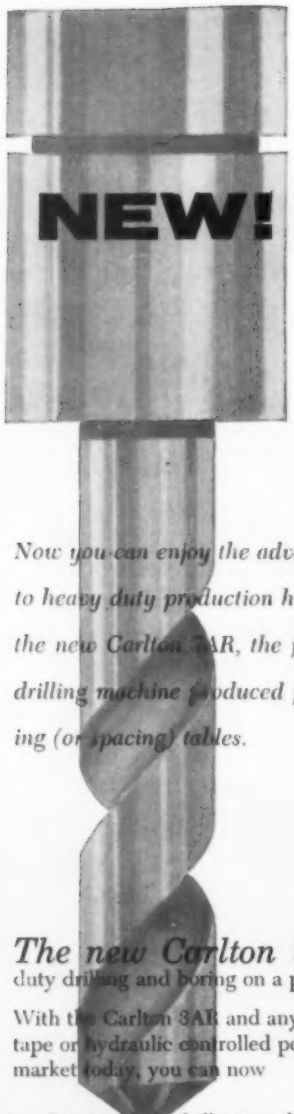
Contact your CL&T Dealer, or write us direct for catalogs on the drill types you need.

Improved Machining Through Research

CINCINNATI LATHE AND TOOL CO.

3207 Disney Street • Cincinnati 9, Ohio

"Tray-Top" Lathes/"Cincinnati" Drilling Machines/"Spiropoint" Drill Sharpeners.



NEW! Carlton 3AR rigid

Now you can enjoy the advantage of automation as applied to heavy duty production hole drilling and boring . . . with the new Carlton 3AR, the first double box column vertical drilling machine produced for use with automatic positioning (or spacing) tables.

The new Carlton **3AR** introduces jigless heavy duty drilling and boring on a production basis.

With the Carlton 3AR and any one of the many fine types of tape or hydraulic controlled positioning tables on the market today, you can now

- Increase hole drilling production *automatically.* Work is positioned under the drill automatically, and therefore, *faster* No delays from human inertia.
- Get precision drilling, boring and spacing. Automatic positioning tables assure precise hole spacing, rigidity of Carlton's double box column construction assures hole drilling precision. No mistakes, ever.

In short, the new Carlton 3AR is made just for you and every manufacturer who needs precision, heavy duty, flexible production drilling and boring. Wire or phone us today for price and delivery estimates.
The Carlton Machine Tool Co., Cincinnati 25, Ohio

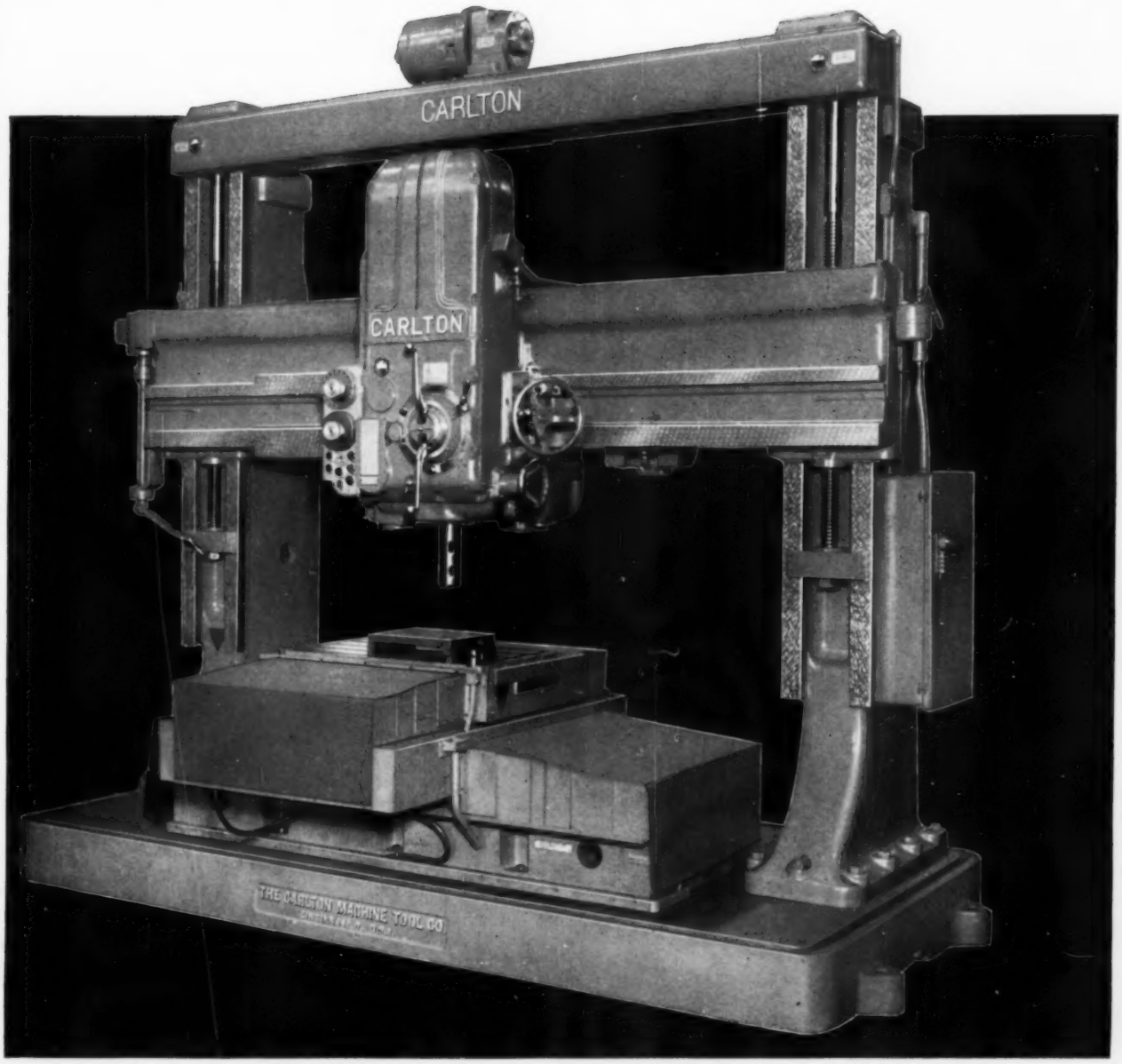
- Twin screw elevating for the rail.
- Headstock movable to facilitate loading and unloading of positioning table.
- Choice of pre-select or manual shift spindle speed control.
- Hand feed wheel equipped with micrometer adjustment dial for precision depth boring.
- As simple and easy to operate as a Carlton radial drill.

specifications

Vertical travel—rail on box posts	27"
Vertical travel—spindle in head	18"
Distance, floor to spindle (min.)	30"
Distance, floor to spindle (max.)	75"
Horizontal travel of head on rail	28"
Spindle speeds, number	36
Spindle speeds, range rpm.	100 to 1
Feeds, number	18
Feeds, range	.004"–.125"
Motor, recommended, hp.	25-30

for the most modern in hole drilling machine tools . . . see

vertical drilling machine



Carlton *specialists in drilling and boring machines since 1916*

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U.S.A.

How Fred Lee

Stan Bozek, Abrasive and Methods Engineer at Marlin-Rockwell Corp., Plainville, Conn., discusses new form grinding technique for ball bearing races with Fred Lee, Manager of Bay State's district office in Bristol, Conn.

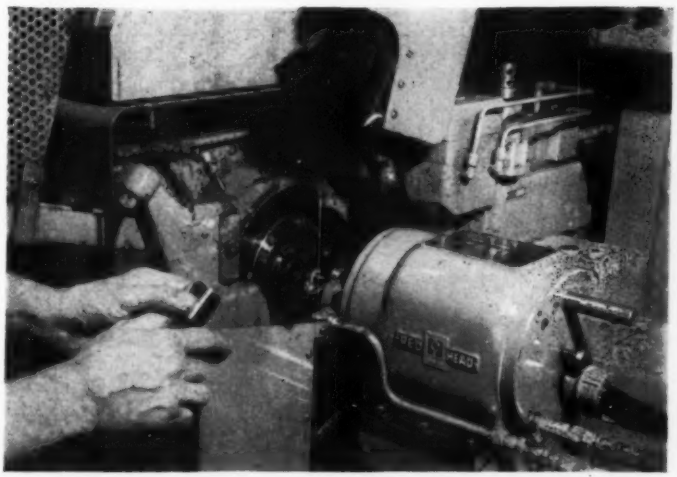
helped revolutionize the grinding of bearing races

Ball bearings used in missile guidance systems and other highly critical applications have to have super-accurate races . . . but cost is vitally important, too. That's why Marlin-Rockwell Corp., of Plainville, Conn., was one of the first bearing manufacturers to switch from the oscillating rubber wheel grinding technique to form grinding.

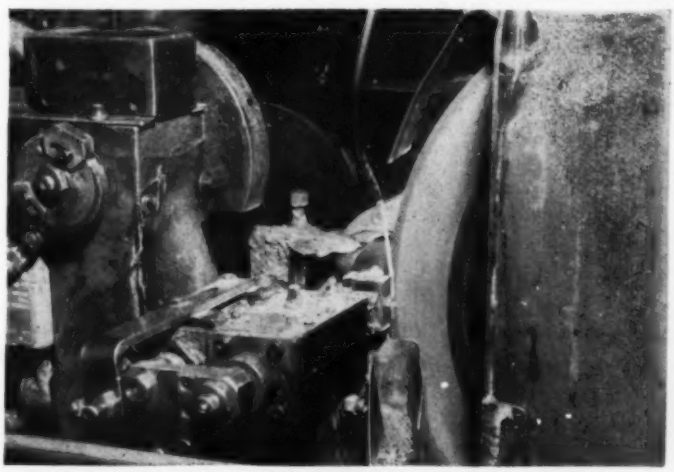
Bay State's Fred Lee, recognized as one of the country's leading authorities on bearing grinding, was called in to discuss the problem with Marlin-Rockwell engineers. After exhaustive study, he specified semi-friable, fine grit, medium grade vitrified wheels that varied in size from ½" to 20" diameter.

Result: 50% closer confinement of race curvature, 100% improvement in roundness and consistent uniformity in multiple production runs. General foreman John Gworek, veteran of 30 years of precision bearing grinding, says flatly: "It's the *only* way to grind them."

Like Fred Lee, your own Bay State representative may be best known as an expert in a particular type of grinding but his general knowledge of grinding techniques is both wide and deep. **Better grinding at lower cost . . . that is his business.**



Form grinding 2 ball races at the same time on water pump bearings with Bay State vitrified wheel, diamond dressed only every sixth piece, on Heald 1701 Form Grinder.

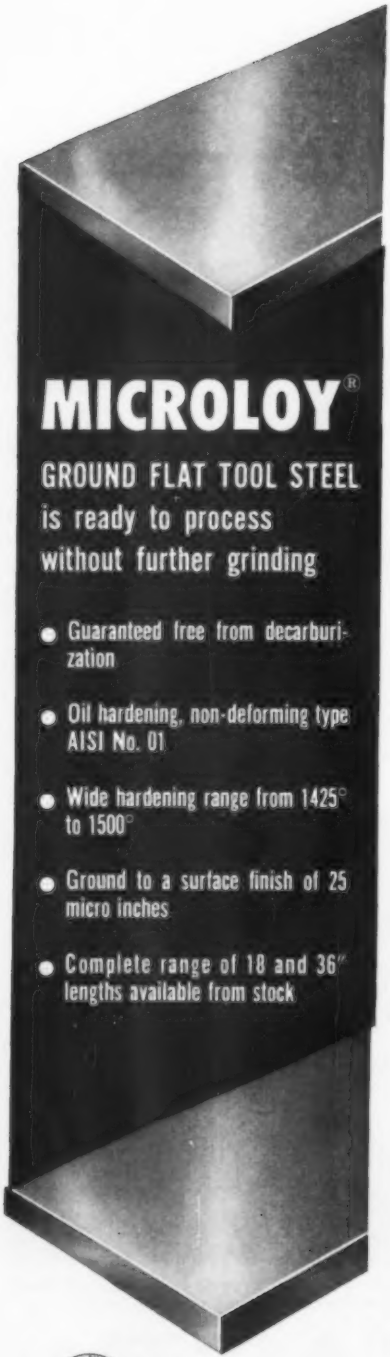


Rough form grinding O.D. contour of inner races with 20" diam. Bay State vitrified wheel (Crush formed) on Cincinnati Microcentric Grinder.

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.



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GROUND FLAT TOOL STEEL
is ready to process
without further grinding

- Guaranteed free from decarburization
- Oil hardening, non-deforming type AISI No. 01
- Wide hardening range from 1425° to 1500°
- Ground to a surface finish of 25 micro inches
- Complete range of 18 and 36" lengths available from stock

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CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Foil's future

Dear Sirs:
I am particularly interested in an article in the "Materials' section: "New future of foil" (*AM*—July 28 '58, p59).

Will you please advise, if possible, where more information can be obtained on this subject?

C E Wallace
Whitman, Mass

Unfortunately, we are not at liberty to give further information on this development at present. A private research organization has been doing the work and does not wish to divulge any additional details at this time. However, as soon as they are available, we will publish them in American Machinist—Ed.

Reprints for training

Dear Sirs:
I notice that you are offering *American Machinist* Editorial Reprints and that you will send a complete list of available reprints on request.

I would appreciate receiving the list and would like to know more about these reprints. Kindly explain just what they have, and are they in pamphlet form, booklet form, or what?

I have something in mind that may work out on some of these apprentice boys we have around here.

Dick Nave
San Antonio, Texas

The reprints are separate copies of individual articles and Special Reports just as they have appeared in American Machinist. *A good many of them are in current use as training material in various courses.*

As you have noted, a list of available reprints and their prices can be secured from our Reader Service Dept—Ed.

Sound deadening

Dear Sirs:
In your article, "Adhesive bonding methods" (*AM*—June 30 '58, p85), I note a photograph of a typewriter showing a polyurethane foam for sound deadening. Nowhere in your copy do you de-

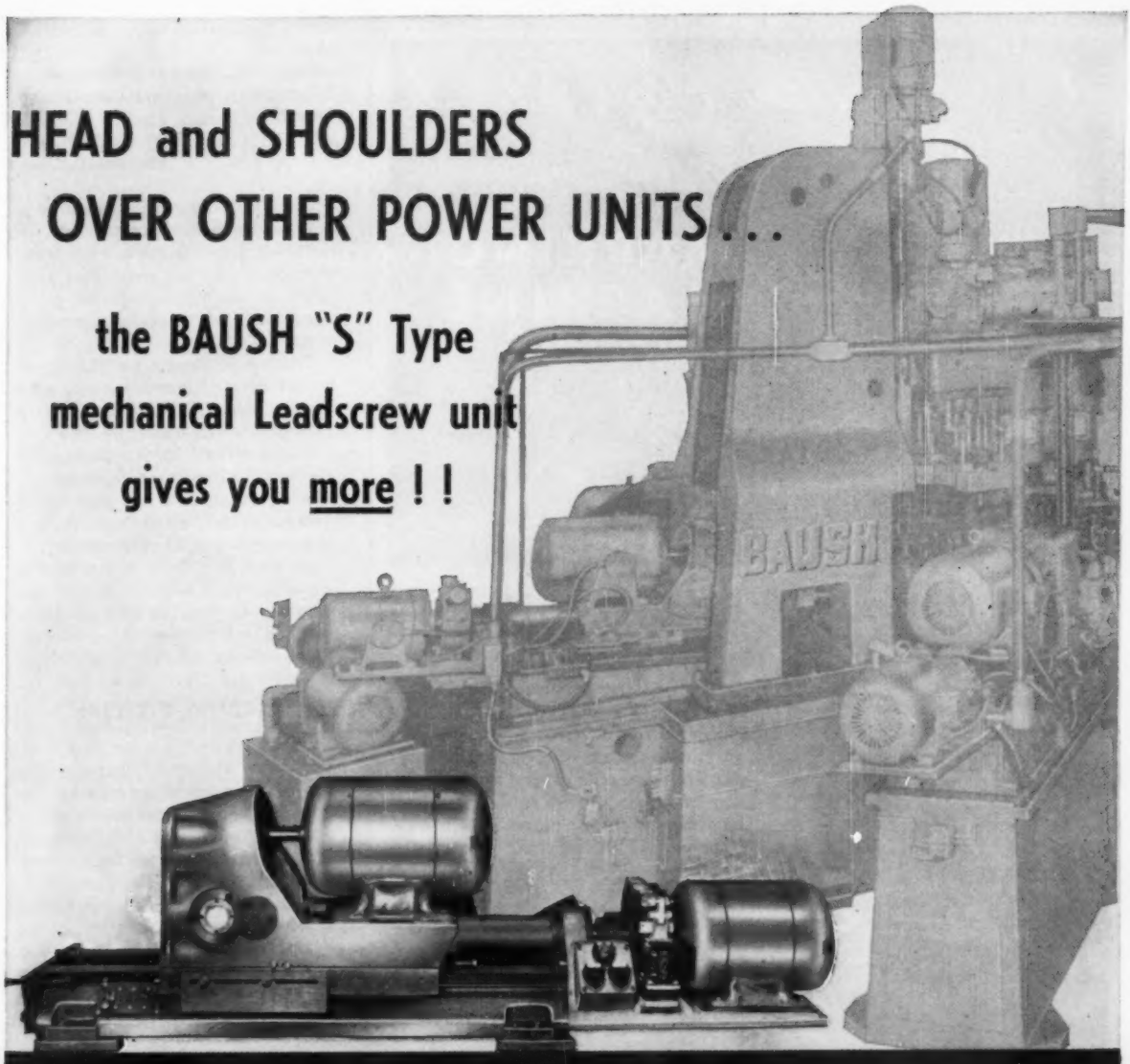
SHOPMATES

N. Jarvis

—IF HE'D TURN THE VISE HE COULD GET THAT OTHER ANGLE IN THAT SET UP—
—HE SHOULD A' USED A ANGLE CUTTER AN' TURNED THE HEAD!
—STRAIGHTEN THE HEAD AN' USE A ROTARY TABLE ON A ANGLE—
WE BETTER GET SOMETHIN' STRAIGHT BEFORE WE LOSE OUR BALANCE AN' BUST OUR HEADS ON THE FLOOR!!
N. JARVIS

HEAD and SHOULDERS OVER OTHER POWER UNITS . . .

the BAUSH "S" Type mechanical Leadscrew unit gives you more ! !



OTHER MONEY SAVING FEATURES

- Less down time — with easy economical maintenance by shop mechanics
- Longer life of motors, gears, spindles, and guide bushings
- Positive, steady tool feed
- No surge or tool breakage in break-thru
- Interchangeability of units
- No costly hydraulic fluids
- No time-killing hydraulic leaks
- Operator starts work immediately — no waiting for warm-ups

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

Roll Marks 6,000 Pieces Per Hour

Here is another Noblewest achievement for faster, better marking at lower cost. Designed and built by Noblewest especially for high production marking of thin walled cup-shaped parts or tubes. Model 482, illustrated, is shown tooled for *Roll marking* a famous name garden hose accessory. Operator simply loads the parts onto the work feed dial. From that point the process is completely automatic.

Whatever your requirements for *permanently indented* marking, you are assured of the finest machines and marking tools when you specify Noblewest.

Write for new comprehensive catalog. Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Connecticut.

Noblewest precision marking dies and tools are the standard for quality and long life. Large facilities permit excellent delivery at competitive prices.

A few desirable territories open to qualified representatives

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING
NUMBERING
EMBOSSING
GRADUATING

scribe where this material can be obtained.

Can you forward a little more information on this particular foam?

Carl K Gieringer
Cincinnati, Ohio

Polyurethane foam is available from a number of sources and in different forms all the way from chemicals for making your own foam to completed foam parts manufactured to your specifications.

The foam shown on the typewriter in our illustration was sold by Presto Manufacturing Co, 2 Franklin Ave, Brooklyn, NY.

The adhesive in this particular application was Bondmaster G527, a product with a non-flammable solvent to suit the manufacturer's requirements. The normal adhesive for this type of bonding is Bondmaster R328T. Both are supplied by Rubber and Asbestos Corp, 225 Belleville Ave, Bloomfield, NJ—Ed.

Heating element

Dear Sirs:

On your "Materials" page, under the heading, "Heating element for 3090 F" (*AM*—June 30 '58, p61), you discuss a new Mosilit metal powder manufactured by Cesiwid GMBH.

We would appreciate receiving the full address of this firm as we desire further information and would like to write them direct.

K W Kenshol
Chicago, Ill

The Mosilit metal-powder, resistance-heating element is manufactured by Cesiwid GMBH, Neumuerhle 4, Erlangen, Germany—Ed.

Helpful Henry

by L. Hoppes

"This is too heavy for you George,—let me help you lift it!"

CALENDAR

Instrument Society of America—Annual Instrument-Automation Conference and Exhibit, Sept 15-19, Convention Hall, Philadelphia, Penna.

American Rocket Society — National Meeting and Exhibit, Sept 15-18, Statler Hotel, Detroit, Mich.

Pressed Metal Institute—Annual Meeting, Sept 28-Oct 2, The Cloisters, Sea Island, Ga.

Society of Automotive Engineers—Aeronautic Meeting and Display, Sept 29-Oct 3, Ambassador Hotel, Los Angeles, Calif.

American Society of Tool Engineers—Semiannual Meeting and Western Tool Show, Sept 29-Oct 3, Shrine Exposition Hall, Los Angeles, Calif.

American Society of Mechanical Engineers and American Society of Lubrication Engineers—Lubrication Conference, Oct 14-16, Statler Hotel, Los Angeles, Calif.

Society of Industrial Packaging & Materials Handling Engineers—Annual Meeting and Exposition, Oct 14-16, Chicago Coliseum, Chicago, Ill.

American Machine Tool Distributors Association—Annual Meeting, Oct 16-17, The Sheraton Plaza, Boston, Mass.

Magnesium Association — Fall Meeting and Exhibit, Oct 16-17, Fort Shelby Hotel, Detroit, Mich.

National Safety Council—Annual Safety Congress, Oct 20-24, Hilton, Congress, Morrison, and LaSalle Hotels, Chicago, Ill.

American Gear Manufacturers Association—Semiannual Meeting, Oct 26-29, Edgewater Beach Hotel, Chicago, Ill.

American Institute of Mining, Metallurgical & Petroleum Engineers—Fall Meeting, Institute of Metals Div, Oct 27-31, Carter Hotel, Cleveland, Ohio.

American Society for Metals—National Metal Exposition and Congress, Oct 27-31, Public Auditorium, Cleveland, Ohio.

THIS BOOKLET . . .
Simplified Our Tool Planning and Helped Us Speed Up Production
WITH OUR
REED
Thread Rolling Attachments

Application and Operating Instructions:
REED THREAD ROLLING ATTACHMENTS SERIES B, TWO-ROLL TYPE
REED ROLLED THREAD DIE CO.
Worcester, Massachusetts, U.S.A.

Engineers, setup men, operators . . . all find helpful information in this booklet, "Application and Operating Instructions," furnished with every Reed Thread Rolling Attachment . . . and available to manufacturers tooling machines for thread rolling.

It furnishes data to help reduce operating costs and produce high quality threads. With this booklet, setup men without previous thread rolling experience have successfully completed the setup for production.

REED Engineering Service . . .

- **Complete Technical Information** for the selection of equipment and tooling for your requirements.
- **Highly Skilled Personnel** to assist with the initial installation as well as subsequent threading applications.

STANDARD SIZES IN STOCK

Write for Attachment Application Booklet B-101

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Specialists in Thread and Form Rolling Tools and Equipment

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DIAMOND WHEELS

THE *COMPLETE* LINE IN EVERY RESPECT

Man-Made or Natural Diamonds

All standard shapes, sizes, diamond depths and concentrations... man-made or natural diamonds in resinoid and vitrified bond. Natural diamonds also in metal bond.

For finishing, semi-finishing and roughing; for carbide tipped single and multiple point tools, chipbreakers; for cutting-off and slotting; cylindrical, internal and surface grinding; electrolytic grinding, lapping and hand honing.

Part of SIMONDS complete line of grinding wheels, other bonded abrasive products and abrasive grain, including silicon carbide vitrified wheels also popular for cemented carbides.

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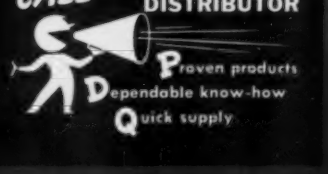

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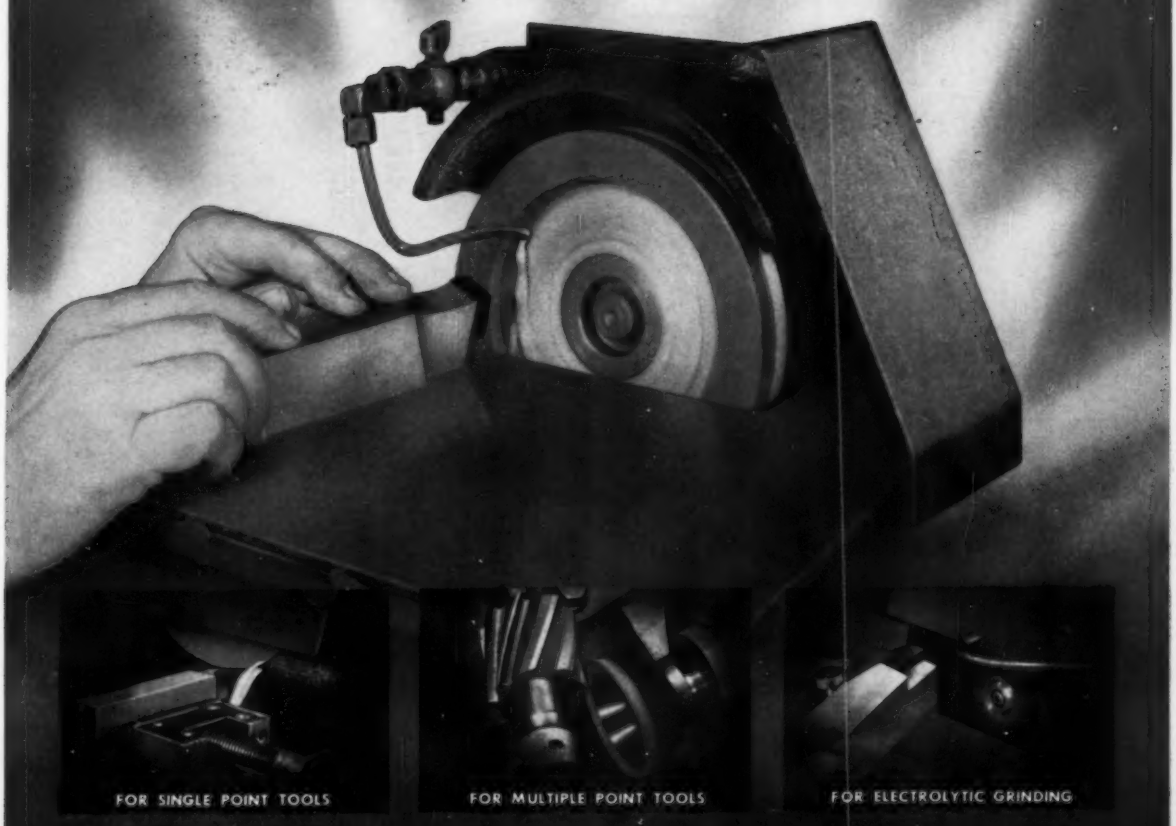
DIAMOND WHEELS

featuring the new MAN-MADE Diamonds up to 35% more efficient for cemented carbides!

Faster cutting action and longer life . . . proven by actual grinding tests! Measured in terms of cubic inches of carbide removed per cubic inch of wheel wear, efficiency ratios averaging up to 35% greater clearly demonstrate the superiority of MAN-MADE diamonds over natural.

Simonds has established an entirely new manufacturing department for the production of "man-made diamond" wheels, embodying the latest machines, equipment and technology in diamond wheel manufacture. For best results specify "man-made" diamonds . . . from SIMONDS!



FOR SINGLE POINT TOOLS

FOR MULTIPLE POINT TOOLS

FOR ELECTROLYTIC GRINDING

at last!
truly practical
numerical
drilling
control

See DIGIMATIC in action at ASTE SHOW
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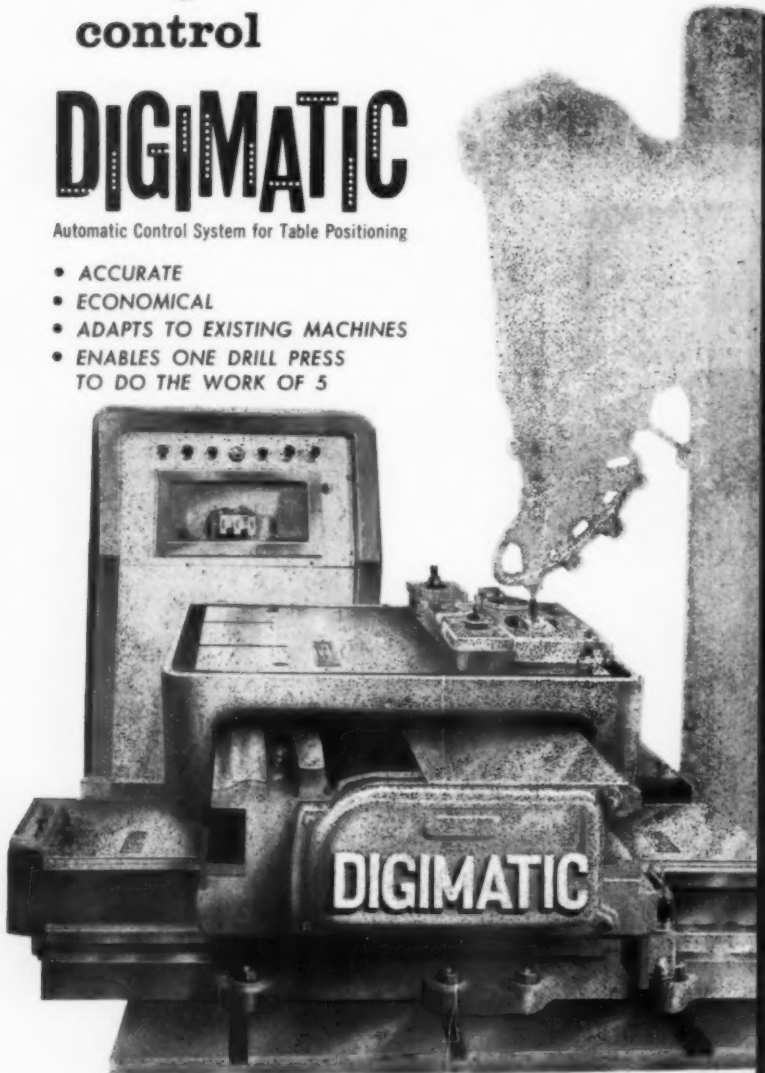
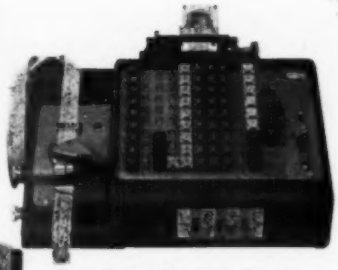
DIGIMATIC

Automatic Control System for Table Positioning

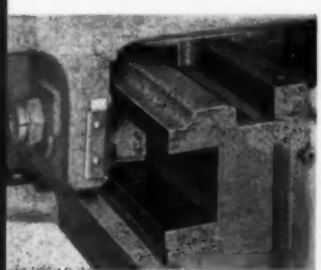
- *ACCURATE*
- *ECONOMICAL*
- *ADAPTS TO EXISTING MACHINES*
- *ENABLES ONE DRILL PRESS TO DO THE WORK OF 5*





Tape Preparation Unit. Easy-to-learn keyboard operation. No special codes... uses simple decimal coordinates. Provides printed accuracy check.

Control Unit. Compact data storage. One foot of 1-inch tape holds all instructions needed for fifteen 2-axis positions.



Rigidly Built Table. Heavy (1200 lbs.). Replaceable hardened steel ways and rollers.

All-Enclosed Mechanism. Completely sealed against coolant and chips to maintain ±0.0002 inch accuracy.

Write for illustrated brochure giving complete details and specifications.

Now available for immediate installation. AUTOMATIC PATH CONTROL SYSTEMS ALSO AVAILABLE FOR YOUR PRESENT CONTOUR MILLING MACHINES

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STROMBERG-CARLSON COMPANY
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Continuous high production plus precision are built into this CTU cylindrical grinder.

You, too, can have the "Touch of Gold" with a Norton Grinding Machine

This is one of the most profitable machines industry knows. It is widely used for the demanding tasks of production precision cylindrical grinding. It is a product of Norton Company's ingenuity and knowledge of the great and varied science of grinding . . . one in which Norton has specialized for scores of years . . . a field in which it has become world leader.

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. . . everything but a good source for die sets,
here's a suggestion.
Die sets are basic to mass production.
They don't need
gadgets, gimmicks or glamorous styling.
Production depends on
sound design, quality materials, accuracy
and reliability, and
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SPOT NEWS...

- **Strong, lightweight extrusions are being made from magnesium pellets** by a new process that, unlike powder metallurgy, requires no compacting or sintering steps. Method is said to achieve structural shapes with 15 to 40% higher compressive yield strengths than those shaped from billet. A standard extrusion press is employed and the 0.016-in.-dia preheated pellets are injected by pneumatic power.

- **Final version of the act extending the Renegotiation Law to June 1959** did not include a provision voted by the House of Representatives to allow for appeals from Renegotiation Act rulings in higher federal courts. The law permits appeals only to the Tax Court.

- **Most assets formerly used by Westinghouse's Industrial Furnace Division** have been sold to Sunbeam Corp's new subsidiary, Sunbeam Equipment Corp, for an undisclosed amount. Deal includes design and engineering files, equipment and production facilities at Meadville, Pa.

- **Powder metallurgy research on compaction and consolidation processes** (particularly roll bonding) is being done on a wide scale in Russia. Developments so far: Rolling of large (36 x 72 x 0.120 in. thick) sheets, thin foil (less than 0.005 in.), and 1.5-in.-OD, 1-in.-ID tubing in 12 ft lengths from titanium alloys; and production of stainless steel powder strip and ductile tungsten-20% rhenium alloys.

- **Speeds of 10, 16 and 20 press strokes per minute** can be achieved by using units of a unique new two-speed clutch either separately or in combination. The two-speed clutch is split into two separate clutches mounted on opposing sides of a press. With fast clutch alone the press operates at 20 spm, with the slow clutch alone at 10 spm, with both together 16 spm.

- **Ford of Canada plans to compete with GM's Holden in Australia,** is building a $40-million plant in Sydney to produce a small car patterned on Ford's English Zephyr. All components will be made in Australia.

- **Automatic slide position device for presses is now under development.** In use, the required die shut height is preselected on a dial in the master pushbutton panel. When slide adjustment is actuated, slide automatically positions itself at predetermined shut height.

- **Electro-chemical machining, a new process developed by Elox,** offers high metal removal rates on large die work. It differs from electrical discharge machining in that a saline solution is used, removal rates are higher, electrodes may be made from any conductive material, and electrode wear is very low. A 5000-ampere unit with an electrode area of 100 sq in. can remove 30 cu in. per hour.

- **Welds with 1½ times greater strength than normal** are being obtained in Russia by mounting the work on a vibrating fixture, which oscillates at a rate of 25 vibrations per sec at an oscillation amplitude of 5/64 in. Grain size is said to be finer, too.

Spot index to major News stories...

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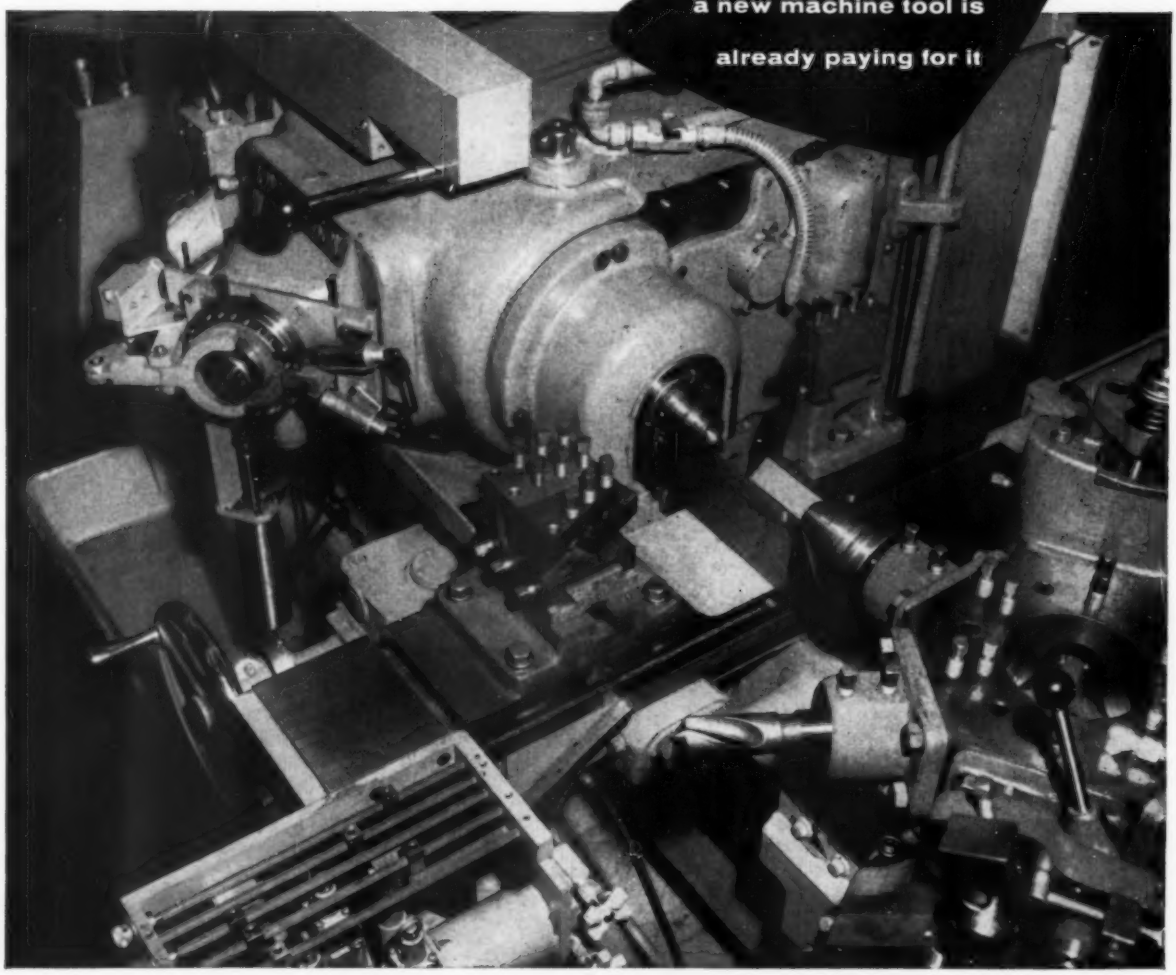
JONES & LAMSON "AUTOMATION"

the man who needs a new machine tool is already paying for it



Where's the Operator?

And for that matter, where's the speed selector? The answer is that they're both absent, because this is a *completely automatic* production operation. It's a custom installation of a Lynn Hydraulic Drive on a Jones & Lamson ram type turret lathe.

This assembly provides fully automatic cycling for both long and short runs. The turret drive provides for rapid approach to the work, variable feeds, controlled dwell, reverse feed, and rapid return of the turret. The cross slide has automatic cross travel in both directions. Feed ranges for the cross slide drive are equivalent to those of the turret drive.

Spindle speed selection, start, stop and reverse are all automatic. Operation of collet chucks and bar feed is also automatic for a continuous repetitive cycle.

Two typical set-ups increased production 26% per machine. One operator handled both machines with ease. Investigate how you can get similar results. Write for literature — Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

WASHINGTON...

Metalworking and Congress...

The 85th Congress racked up a wide-ranging legislative record of importance to metalworking industries. It provided a spur to hard goods production with a peacetime record military appropriation of $41 billion—with $15.2 billion earmarked for hardware procurement and $2 billion for weapon R&D.

Other significant defense measures: (1) Reorganization of the Pentagon, providing for greater centralization over R&D and more rapid decision-making on production plans and other key military policies; (2) creation of a new civilian agency, NASA, to plan and conduct an extensive space exploration program, with new powers to buy hard goods from industry; (3) liberalization of the atomic secrets law to allow sharing of atomic data with other allies besides Britain; (4) provision of $386 million in new domestic facilities for research, atomic power, and plutonium for weapons, and U S backing for 1-million KW of atomic power in six West Europe nations; and (5) extension of the Renegotiation Act to June 1959.

Trade, taxes, small business...

As an election-year and anti-recession aid to small business, Congress granted an estimated $260 million in the form of new fast tax write-offs on capital equipment (see p 84), provided a better break on retained earnings, estate taxes, and loss carrybacks. It also set up SBA as a permanent agency with lending authority boosted from $250,000 to $350,000. And a $250-million revolving fund for new private banks was authorized to provide long-term loans to small firms.

On the tax front, Congress also extended the 52% corporate rate and excise taxes until July 1, 1959. On the anti-recession front, it boosted highway construction expenditures almost $2 billion (of which $400 million must be spent by December 1); and to stimulate home-building, pumped $1.5 billion into the home mortgage market and reduced downpayments on FHA houses.

In the foreign trade field, Congress renewed the Reciprocal Trade Act. Though the new law allows the President to slash tariffs 20% below current rates, no significant reductions are likely in the next four years. The new law makes it easier for U S industries to get protection against foreign competition. Domestic industries are also aided by a change in the anti-dumping law, lending new weight to sympathetic Tariff Commission rulings and making it easier to prove foreign goods are selling below "fair value."

Transport, foreign aid, labor...

To help both shippers and transportation industries, a 3% shippers' Freight Bill Tax was repealed.

Railroads got a shot in the arm with more freedom in rate-making, leeway to abandon service on losing lines, and a $500-million loan program. A new Federal Aviation Agency, with procurement powers, was set up to supersede CAA and take over Civil Aviation Board's rule-making functions.

Over $3 billion was voted for foreign military and economic aid. Social Security payrool taxes paid by both employer and employee were boosted. A law was voted requiring public filing of financial reports on labor welfare and pension fund plans covering over 25 employees.

Military budget gripes...

The Pentagon's military professionals—especially in the Air Force—are griping loudly once more about budget limitations. This comes in the face of administration plans to boost defense spending by some $2 billion this year. The critics claim much of the increase will be consumed by inflationary cost increases and pay raises rather than by a significant boost in R&D effort or in military hardware procurement.

But most significantly, they're worried over the possibility of a new holddown on federal expenditures. The administration is seriously concerned about inflation, is seriously studying new cuts in both military and civilian expenditures as a means of curbing inflation.

But even without the new inflationary issue, the Pentagon pros are grumbling that Defense Secretary McElroy hasn't turned out to be as big a spender as they had expected.

The fact is this: Output of missile prototypes for testing is still much lower than Air Force development officials want, while planned production rates of IRBM's and ICBM's are well below what Air Force strategists recommend. This is what's behind the new rash of stories you read about the "critical gap" in U S defenses—the claim that during 1960-64 U S deterrent power (now represented by our superior heavy manned bomber force) will be offset by overwhelming Soviet missile might. Air Force brass are planting "leaks" to dramatize the alleged deficiency.

facts about LEDLOY* FREE-MACHINING STEELS

Inland's Special Ledloy Screw-machining Steels Outperform B1113 and in Certain Cases Brass*

There are two grades of Inland Ledloy Steels that have been developed specifically for automatic screw-machine operations, Ledloy Grade A and Ledloy Grade B.

Ledloy Grade A, the most widely used leaded steel grade, machines from 25% to 55% faster than regular free-machining steels and yet retains all the desirable characteristics. Ledloy Grade A contains .15/.35% lead—uniformly dispersed through the steel so that it has no appreciable effect on the steel except to increase its machinability to a marked degree. Ledloy Grade A retains all the properties of open hearth free-machining steel of comparable base analysis.

Whatever you have been machining from regular free-machining steels you can machine from Inland Ledloy Grade A and increase your machining time up to 55%, and at the same time, obtain a superior surface.

The place of Inland Ledloy Grade A has been so firmly established in the screw-machining industry that the A.I.S.I. and S.A.E. have adopted a new grade designation tailored to its specifications. *The new standard grade designation is* C12L14.

Inland Ledloy Grade B, the fastest machining steel produced commercially today, was developed by Inland to replace brass in the manufacture of parts where machinability is the all-important factor. Ledloy Grade B provides much greater strength than brass, yields more parts per pound and yet machines from 80 to 90% as fast as the more costly free-machining brass grades.

Ledloy Grade B, like Grade A, is an open hearth steel with all the desirable open hearth steel qualities. It is rephosphorized, resulphurized and lead treated. The only difference between the two grades is that Grade B contains a higher sulphur content. This additional sulphur increases the machinability of Grade B over Grade A about 25%.

In deciding which grade of Inland Ledloy is best for a particular part you are machining, weigh carefully the following factors: amount of machining to be done on part, type of machining, machining time per cycle, strength required in finished part and cost of material.

Where average machining is called for, you will probably find Ledloy Grade A the most practical. Where more machining operations per part are required, or where the machining is more intricate, Grade B will probably be more satisfactory. The additional cost of Grade B can be more than made up in decreased machining costs.

Whichever grade of Inland Ledloy is best for your particular machining operation, you will find that Ledloy will provide fast machining and excellent finish for the parts you make. Ledloy, because of its lower friction component and inherent lubricating characteristics, will also greatly increase the life of your cutting tools.

Many grades available—Inland Ledloy free-machining steels are available in a wide range of standard carbon and alloy grades in bar form. Ledloy free-machining plates are also produced.

If your product requires machining, it will pay you to get all the details on Inland Ledloy . . . the original leaded steels. Ask your cold-drawer about them today, or write Inland Steel Company, 30 West Monroe Street, Chicago 3, Illinois, for the interesting booklet, "Properties of Inland Ledloy Steels."

INLAND STEEL

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INLAND

Ledloy Steels
the world's most machinable

*Reg. Trade Mark

TRENDS

DETROIT...

Happy new auto year...

By Detroit's erratic calendar, the old year is over and good riddance. Automakers working as of the end of August were building 1959 models. This group includes American Motors, Buick, and some Chrysler lines.

According to a preliminary tabulation in *Ward's Automotive Reports,* 4,280,217 passenger cars were built in US plants during the '58 model run. This was over a 30% drop from the 6,212,-291 total of the previous year.

Only Dodge, Willys, and IHC among the major truck producers are active, with the latter make suffering a serious transmission shortage because of a strike at Fuller Mfg Co.

No policy change...

GM President Harlow Curtice's last official act was a statement that his retirement would result in no change in the company's adamant stand against the UAW-CIO.

The newly elected chairman of the board, Frederic G Donner and President John F Gordon, have both been closely identified with development of policy in these areas for many years and have helped to guide current negotiations.

Donner, formerly executive VP, succeeds Albert Bradley—but with the important difference that he will also be chief executive officer. The new chairman is little known to the public, having spent all of his 32 GM years as a financial man with headquarters in New York.

Gordno, an Annapolis graduate and engineer, headed Cadillac Division in the mid-'40's and most recently was in charge of Body and Assembly Divisions. Oddly enough, after 35 years with GM one of his favorite hobbies is just "driving around."

James E Goodman, VP and general manager of Fisher Body Division, moves up to head the Body and Assembly Group and has been elected a director. He is succeeded at Fisher by Edwin C Klotzburger.

Reuther's whistle...

With a second wind garnered from parent AFL-CIO's recent pledge of backing, both moral and financial, there is a new note of authority to Walter Reuther's pied pipe.

GM's top negotiator, Louis Seaton, says "It is patently clear that someone has pressed the button at Solidarity House" and warns that the epidemic of walkouts at Fisher Body and component plants "will paralyze 1959 model production . . . It is "hit and run guerrilla warfare."

Strike grounds are flimsy. For example, 7000 workers at Pontiac walked out because a small number of tool and die men were asked to work overtime to set up production machinery. Chrysler, too, has been seriously hampered in changeover by its recalcitrant local unions.

Economy optional...

Auto writers recently previewed the new Pontiacs, noted down "startlingly good looks," even though the new bodies are 3 in. wider on either side. The obesity was evened out by 3½ to 6 in. greater length.

Division General Manager Semon Knudsen is sticking with the standard GM forecast of a 5.5-million car year and plans to obtain for himself 7% of this figure. That adds up to 385,000 Pontiacs and a sure fifth place in industry sales.

Knudsen remarked that "1958 marked the end of a rough chapter in the auto industry—a year in which scarcely enough new cars were bought to replace the number junked."

Fuel injection has been dropped. Instead Pontiac will plug a 225-hp V-8 for which 20% greater economy is claimed on regular grade gasoline. This economy is optional at no extra cost. The standard engine will be a husky 300-hp job. The car will bow October 9.

Progress in turbines...

GM's forthcoming Motorama, to open in New York on October 16, will feature Firebird III. The 225-hp turbine-powered car looks unreal on the ground—for it is styled like a two-passenger Sabrejet with clipped wings. All accessories are driven from electric and hydraulic power supplied by a 10-hp, 2-cyl engine mounted under what normally would be the hood.

The rear-mounted regenerative turbine, called GT-305, gives 25% greater economy than its predecessor, despite a 10% increase in power and a 25% reduction in weight.

Suspension is air-oil; and steering, braking, and acceleration are controlled by a small stick mounted in the center so that either passenger can drive without changing seats. If the road is as modern as the car (containing a buried electronic circuit), the controls are set up to respond to this automatically.

Specialty features include an automatic timer to precool or heat the car, fluorescent low-beams in the headlights, an ultrasonic door and ignition key, and two-way radio.

DRILLS or TAPS

6 different diameters in **22** *SECONDS!*

The new BURGMASTER

Bench Model Turret Drill

- Power indexes between stations
- Individual speeds on each spindle
- 2 complete speed ranges
- ¼" maximum capacity
- Protective overload slip clutches on spindle drive and indexing mechanisms

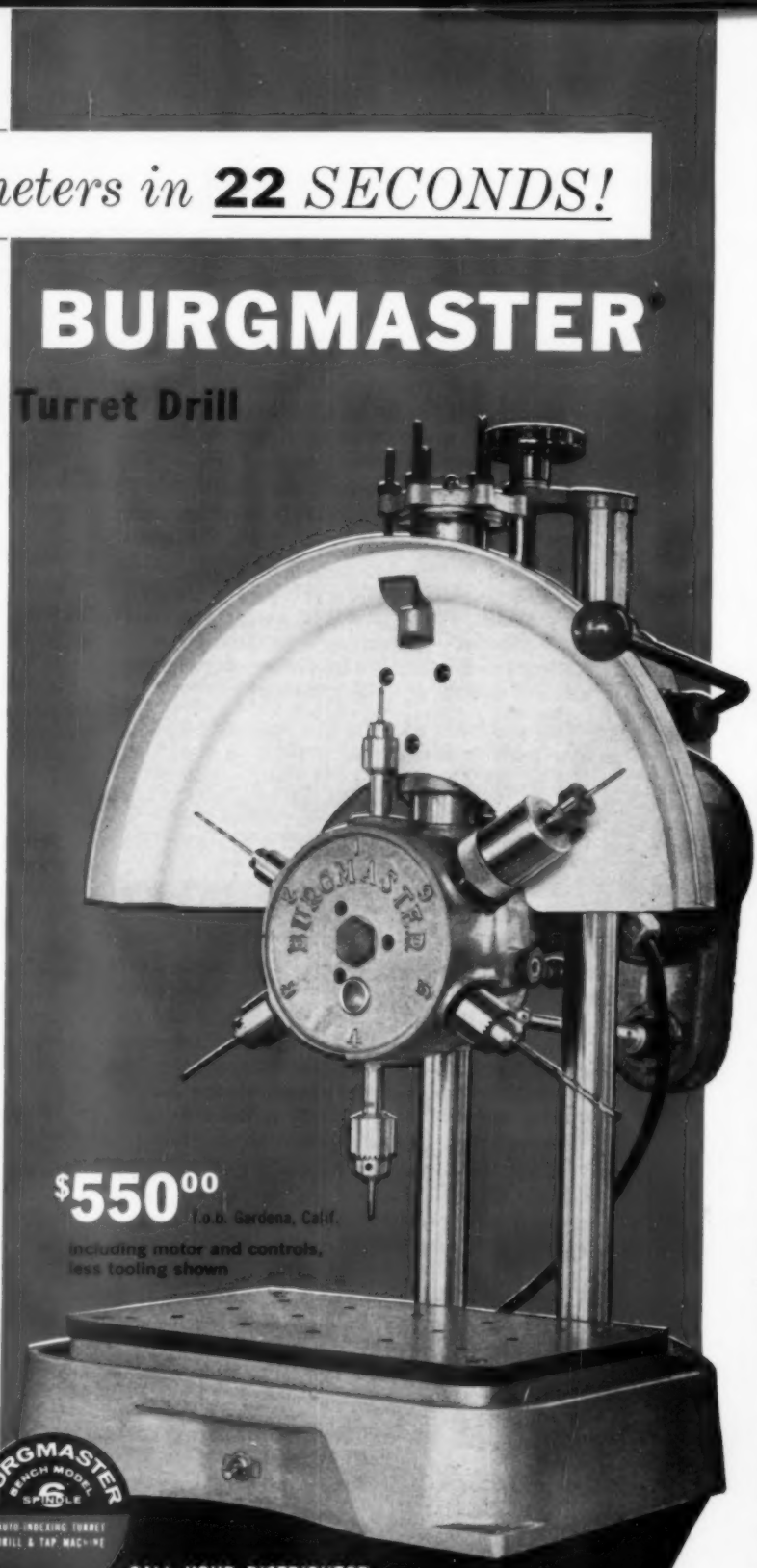
Here's the newest, most efficient drill press available for making small holes, faster! A Burgmaster *finishes* the job in the time normally required *to move work from spindle to spindle*—without machining! No lost motion, no operator fatigue...the powerful Burgmaster Bench Model drills up to ¼" diameters in steel; taps, counterbores, countersinks, reams, spot-faces!

INSTANTLY INDEXES ITSELF to each new station for a change of hole diameter or tooling. Duplicate operations can be performed with any spindle *without indexing.*

INDIVIDUAL SPINDLE SPEEDS—Each spindle *has its own speed* for greatest drilling efficiency with different tool sizes and without changing belts, gears, etc. Two spindle speed ranges cover 95% of all machining requirements with tools up to ¼" in diameter. Spindles can be located in any station sequence for maximum production efficiency.

For greater output, for lower cost per hole get the new BURGMASTER Bench Model!

SPECIFICATIONS: Maximum capacity, ¼" in steel; overall dimensions, height 31½"; width, 17"; depth 20"; motor, ¼ hp; chuck to base clearance, 10¼"; maximum spindle travel, 2⅞"; center of spindle to column clearance, 5⅜"; geared head permits each spindle to operate at a predetermined speed between 350-6200 rpm.



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AIRCRAFT and MISSILES... TRENDS

Boeing and the chemical bomber . . .

There's talk on the West Coast that Boeing, which banked heavily on getting the B-70 chemical bomber contract last year and lost out to North American, will seek subcontract work on the plane.

Boeing has large areas of its main Plant II available for such work, now that B-52 assembly is phasing out at Seattle. Too, Boeing has been doing a lot of experimenting with titanium, said to be a critical material for the B-70. Best guess is that Boeing will seek a subcontract to do wing manufacture.

Boeing meanwhile is stepping up production of Model 707 jet transports at Renton, Wash, and has reached peak output of 15 KC-135 jet Strato-tankers a month right on schedule.

So far 10 Model 707s have rolled off the final assembly line, with nine more in final assembly, as is the first Intercontinental jet.

Lockheed enters a new field . . .

Lockheed Aircraft's Marietta, Ga, Division has just gone into production of ground support equipment for aircraft and missiles, has established a Special Products branch to do the job.

Lockheed Marietta is offering to produce missile airframe subassemblies, special-purpose trailers, containers, pallets, dollies and other ground support equipment for other companies, and will do subcontract work on tools, parts and assemblies, aircraft and missile subassemblies.

The delicate touch . . .

Delicate manufacturing and assembly operations are duck soup for Lear Inc's brand-new 172,800-sq-ft plant at Grand Rapids, Mich.

Lear-Grand Rapids will turn out components and assemblies for missile subsystems, including extremely critical stable gyro platforms for the Bomarc and Nike-Zeus missiles, and servo controls for the Army's Sergeant missile.

Plant environment is carefully controlled to eliminate excess humidity and temperature changes, and dust.

To accomplish this, positive air pressure is maintained in the plant to keep dust from entering when doors are opened. Light fixtures are flush-mounted in vinyl-covered acoustical tile ceilings so that dust cannot gather on them. Fixtures are serviced from a space between ceiling and roof. Employees wear only Lear-provided footwear and nylon clothing, when in clean areas.

Before entering these areas, workers pass an electric eye, which starts an overhead blower and vacuum cleaner to blow them free of dust. Precision assembly of critical parts takes place in an ultra-clean "white room," which resembles a hospital operating room in cleanliness.

NASA budget cut . . .

Despite all the Congressional furor over the "adequacy" of the administration's plans for space exploration, the lawmakers slashed $45 million from the fiscal 1959 appropriation for the National Aeronautics and Space Administration. Congress voted $80 million in new funds for the new civilian space agency, but cut $20.2 million from NASA's research & development request, $22.8 million from its construction and equipment program, and $2 million from the money request for salaries and administrative expenses.

In addition to the $80 million in new funds, NASA's program will be supported this year by $117 million transferred from the Defense Dept's Advanced Research Projects Agency (which is now limited to military space projects and excluded from purely scientific investigations) and $101.1 million previously appropriated to its predecessor agency, the National Advisory Committee for Aeronautics.

NASA's budget cut comes as a rude shock to the new agency. If anything, it was anticipated that Congress might add funds to the NASA appropriation request—as had been done to the Defense Dept budget for missiles and other new weapon development projects.

After all, it has been generally assumed in Washington that Hugh Dryden, Director of the old NACA, was not promoted to NASA Administrator because Congressional space enthusiasts were irritated by what they considered Dryden's less-than-fervent ideas on what the new civilian space agency should do.

Second lunar probe shot . . .

The Air Force's second lunar probe launch attempt is now set for some time during September 14-16. Fifty-two contractors—both industrial and scientific—are working on the project. Overall technical direction and system engineering is in the hands of Space Technology Laboratories, a Ramo-Wooldridge Corp subsidiary now being set up as an autonomous operating organization to allow R-W a better chance to compete in missile hardware development and production. Space Tech Labs has performed R&D on ground support components and subsystems for the Lunar Probe Project, has supervised development of hardware for the project's second and third stage rockets and the rocket payload.

◀ CIRCLE 271 READER SERVICE CARD

You can CUT YOUR COSTS with these new and improved CLEVELAND TOOLS

The Cleveland Twist Drill Co., with its more than 80 years of experience and "know how", is constantly working on new developments and improvements to keep pace with modern metalworking techniques. Every tool, designed and manufactured to the same high standards which have made the familiar ◈ trademark famous, will give you *more production per dollar.* For complete information, contact our nearest Stockroom or . . .

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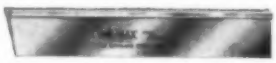

MO-MAX T-Shaped Ground Cut-off Blades

These improved blades are available in MO-MAX or MO-MAX COBALT High Speed Steels, heat treated to produce *more cuts per grind.* Head and body are ground to close tolerances, resulting in accurate uniformity and reduced set-up time.

Split Sleeves for Straight Shank Drills

The hole in these high quality sleeves is concentric with the body, assuring less run-out at the drill point, longer tool life and better holes. Used with tanged straight shank drills, you get *more flute length at lower cost.*

MO-MAX Hardened and Ground Drill Blanks

New Drill Blanks—hardened all over, and ground without back taper. Wire gauge, letter and fraction sizes, No. 80 to ½ inch, singly or in sets. Useful for making punches, tool bits, countersinks, boring tools, burring tools, etc.

Carbide Die Drills for Hard Steel

For drilling hardened steel in the range of 48 to 65 Rockwell C. Holes may be drilled without annealing or appreciably changing the structure of the material. Can be used with or without coolant.

END MILLS

Two Flute Extra Long Ball-nose

They have the extra length for milling fillets and pockets which cannot ordinarily be reached by the conventional length end mills. With these center cutting end mills, the initial hole may be "drilled".

Hy-Spiral Two Flute Double-end

Proper rake angles and cutting edge relief assure efficient milling in nonferrous materials and in the harder alloys. Positive chip ejection . . . no build-up on the cutting face. Especially economical on long runs.

Two Flute Double-end Ball-nose

Machine-ground notch and ball end assure the easy removal of chips in deep slotting and pocketing operations, with the resultant savings realized in more material milled per grind. Economical on production runs.

Heavy Duty with Duo-Drive Shanks

The 2 inch DUO-DRIVE shank fits the conventional two-set-screw-drive holder as well as the bayonet-lock type of holder. Heavy web construction, accurate machine-ground end-tooth notching and special surface treatment.

500 SERIES Four Flute Center-cutting

Now you can get the plunge cutting ability of a two or three flute end mill with the finer finishes and better size control that are possible with a four flute end mill. Made with square nose or ball nose.

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MACHINE TOOLS...

More money for replacement...

Secretary of Defense is reported to have told each of the three armed services that he will make available $10 million to each for modernization of production equipment if they will submit specific justifications for individual projects. These funds, totaling $30 million, would be supplementary to $41.6 million already approved by Congress ($21.6 million for the Navy and $20 million for the Air Force).

More than that, the Defense Department is believed to have indicated that if the extra $30 million is used up, further supplementary funds can be dug up for machine tool modernization. **Some $71.6 million** thus is immediately available if and when the military departments themselves come through with justifications. And the possibility of more money is in the offing.

Justifications for replacement and modernization can come from service contractors using government machines as well as from arsenals, Navy yards and any of the direct Air Force productive facilities.

These developments will tend to bring spending of the armed services for modernization more in line with the ideas of the Department of Defense as originally enunciated in 1956. The policy then adopted would permit expenditures up to $150 million a year. The Navy up to now has come closer than the other two services to carrying out Pentagon's broad policy.

Air Force changes buying policy...

A new policy of the Air Force puts responsibility upon the outside contractor for buying with his own money whatever general-purpose machine tools are needed to carry out a production contract. The Air Force itself will spend its own funds only for production equipment of such special design that the contractor obviously could not be expected to risk his own funds.

From now on all quantity purchases of machine tools to be made directly by the Air Force will originate at Warner Robins Air Materiel Area, Robins Air Force Base (Macon) Ga. Some time ago machine procurement for Air Force maintenance base activities was moved from Wright-Paterson Field, Dayton, Ohio, to Macon.

Distributors add salesmen...

About 84% of distributors surveyed by the American Machine Tool Distributors' Association have as many outside sales engineers as a year ago, and some of them have more, despite a drop of 50% in business. The over-all total is up.

Plans are afoot to increase sales forces 9% over 1957. "We must invest more time and money in sales effort to build for the future," Frank H Habicht, AMTDA president, comments.

Distributors are using better management methods to reduce administrative personnel needs. The survey shows that today six inside people are serving nine sales engineers. Just a year ago six inside people served eight.

Italian Show at Milan...

First Italian Machine Tool Exhibition is to be held at Milan September 11th through the 21st at the Samples Fair Exhibition Building. Exhibits will be mainly of Italian machine tools, though machines of other countries will be displayed by Italian sales agents.

The show is described as complementary to the European Machine Tool Exhibition which is now on an every-other-year schedule, the next one being in Paris in September 1959. The Italian Show was organized and will be managed by UCIMU (Italian Machine Tool Builders Association).

Baker Brothers add line...

Baker Brothers Inc, Toledo, has purchased the Detroit Screwmatic 750 line from Gear Grinding Machine Co, Detroit. A single-spindle automatic bar machine with ¾-in. diameter capacity, the machine will be known from now on as the Baker automatic bar machine. It is produced in two models and is constructed of 10 individual units for easy maintenance.

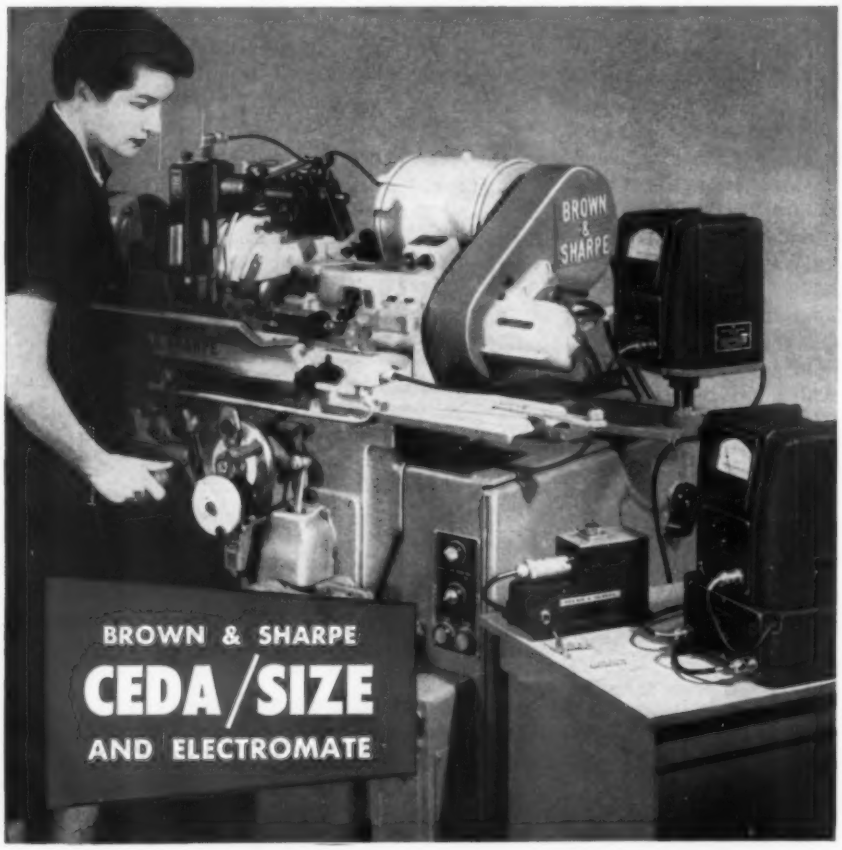
Thompson grinders in England...

Thompson Grinder Co has licensed Coventry Gauge & Tool Co, Coventry, England, to make its range of grinding machines. First machines to be built will be those with 12-in. wide tables and 12 and 20 in. diameter wheels. Truforming series of machines for precision grinding of components with complex contours also will be made, as will die block grinders. Later on special and larger machines will be added.

There seems to be no letup in the trek of U S builders to the United Kingdom to establish some sort of manufacturing operations, either by outright purchase of British companies, by licensing or by setting up production facilities through newly-created affiliates. In at least one case, cross-licensing arrangements are in the making.

BF

Grinding to ±0.000010" or less
in production – with average operators



...clearance of mating parts held to ±0.000020" or less

IS YOUR PRODUCTION of precision parts still paced by slow, high-cost methods such as lapping? If the specified size can be *measured,* it can now be *duplicated,* within millionths, *by plunge grinding* — with the new Brown & Sharpe CEDA SIZE Plain Grinding Machine.

CEDA SIZE was first developed to permit grinding to the extremely close limits required for sizing and fitting fuel injector and missiles parts — on a *production* basis, with operators of limited experience. Now, it is the practical answer to closer tolerance specifications for many products, such as gages, tools, instruments, and precision machine parts. With the Electromate attachment, combined with CEDA SIZE, clearances in mating parts can be held to 20 millionths or less.

Why not get figures on your potential savings with CEDA SIZE? For complete information, write: Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

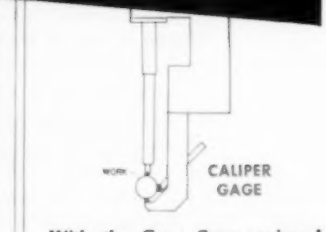
PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe

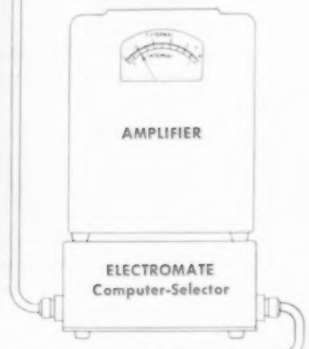
MILLING, GRINDING, AND SCREW MACHINES

MACHINE TOOL ACCESSORIES • PRECISION TOOLS • HYDRAULICS • CUTTERS

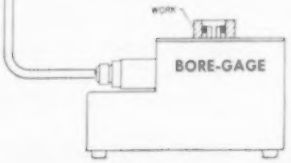
A new era in precision



With the CEDA SIZE equipped B&S No. 5 Plain Grinding Machine, diameter readings are transmitted to Amplifier from Electronic Caliper Gage riding on work. When diameter is within about fifty millionths of finished size, CEDA SIZE lever is depressed, which produces and controls an extremely fine grinding feed. When Amplifier indicator reaches zero, the specified size has been duplicated to ±0.000010" or less.



The ELECTROMATE Computer-Selector attachment, when used with CEDA SIZE, automatically computes the differential between the internal diameter of the mating sleeve (set on Electronic Bore Gage) and the external diameter of the part being ground. When indicator reaches zero, clearance (preset with masters) has been duplicated to ±0.000020" or less.



In addition to CEDA SIZE and ELECTROMATE the No. 5 Plain Grinding Machine shown is also fitted with ELECTRALIGN (upper rear amplifier) to insure easy, accurate control of taper.

MATERIALS... TRENDS

Plating iron-powder parts . . .

A new system of mechanical (no electricity) plating for applying zinc, cadmium, tin, lead, or brass to iron powder parts has been developed by Minnesota Mining and Manufacturing Co. Parts are given a copper flash, by electroplating, and then are plated by tumbling in a closed barrel in an aqueous slurry of special promoter chemical, metal powder, and glass beads. Coating thickness is controllable within 0.01 and 0.0001 in.

Zinc is the metal plated most frequently, thus far, because of its advantage in preventing corrosion. Parts of any configuration can be plated by this process which, while similar to peen plating, is significantly better. Salt spray tests show performance equivalent to galvanizing. 3M plans to sell the equipment, impact media, and promoter chemicals.

Strip from powder . . .

With quality problems solved, it's now possible to set up production lines to roll strip at savings of 80% of conventional equipment and rolling costs. E W Bliss announces independent test results which show mechanical properties superior to those obtained with electrolytic-grade copper strip produced by conventional methods. Similarly, the oxygen content of strip rolled from powder is substantially lower.

Powder metal copper coils used in the tests were 0.040 in. gage, 6 in. wide, and 100 to 200 pounds in weight. From this thickness, they were annealed and cold rolled to 0.010 in. thickness on a conventional four-high rolling mill. No edge cracking or other difficulties occurred. After cold rolling, the strip was again annealed.

Shinier zinc . . .

A better polish on metallic-zinc surfaces is obtained by adding ethyl alcohol to the polishing bath (HNO_3, H_2O_2). The metal should be immersed in this bath for about two minutes.

Resistant to atmospheric oxidation up to a temperature of almost 535 F, the high-gloss surface is unmarked even after immersion in a sodium-potassium-nitrate bath.

Soviet mineral finds increase . . .

Recent major finds of mineral deposits by Soviet geologists and prospectors include an iron-ore deposit in the vicinity of Nowo-Oskol (Belgorod district) containing at least 300 million tons of ore. Large deposits of sulfur and fluorite have been found in the Ukraine and "enormous quantities" of copper and nickel-bearing ores are available in the Murmansk district. Extensive deposits of bauxite (aluminum ore) have been unearthed in Kasachstan.

Large quantities of precious metals, especially gold, have been discovered in Siberia as well as in the far-eastern provinces. Diamond discoveries in Jakutien suggest this will prove one of the most important diamond-bearing fields in the world. With these examples, Soviet Minister of Mines Anropow claims that Russian mineral resources are presently extensive enough to meet the country's needs for many years.

While these discoveries are certainly of economic importance, it may be some time before Soviet industrialization reaches the point where mining equipment, transportation, and refining facilities are available to transform major quantities of these minerals into products.

Watch those clamps . . .

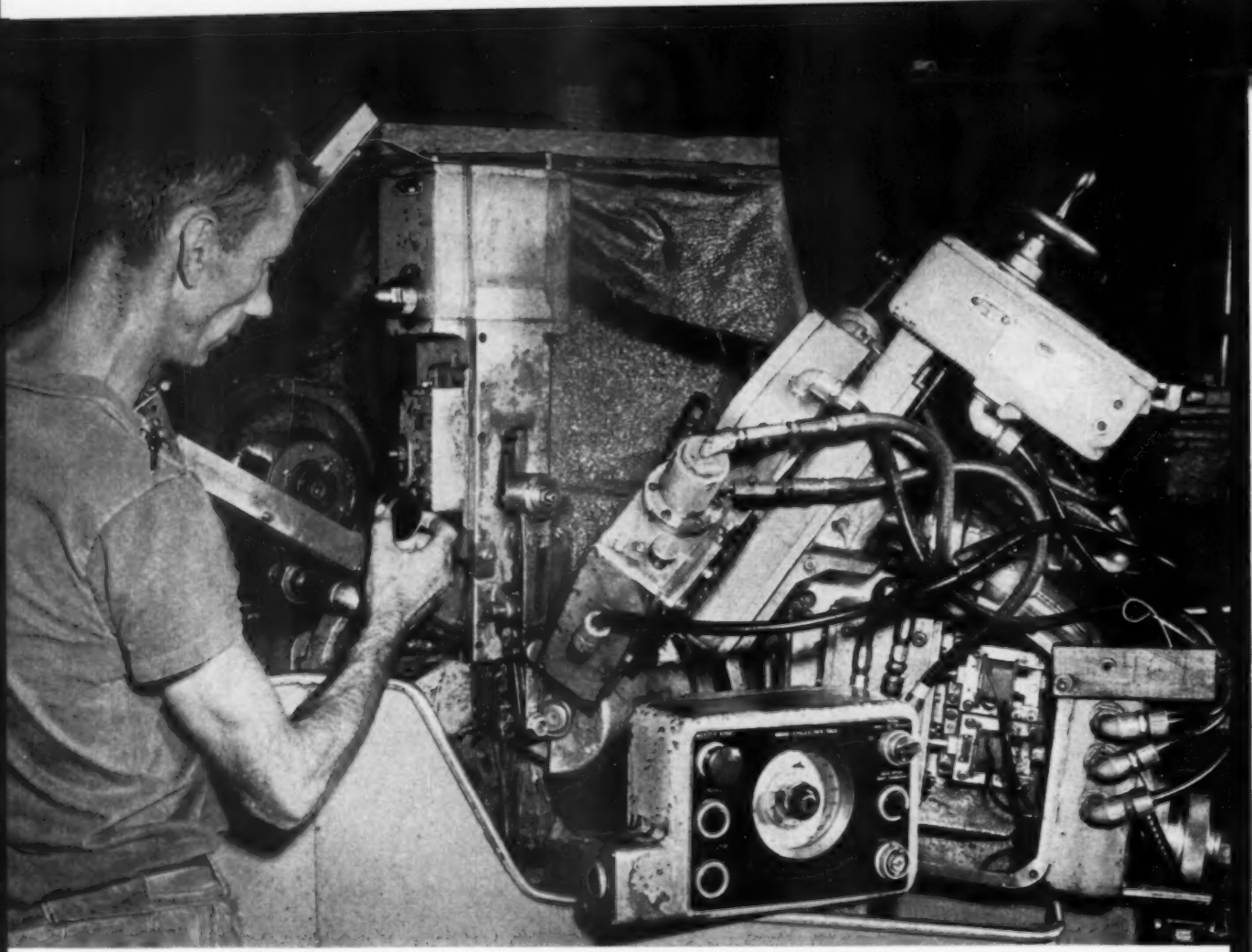
Allis Chalmers Mfg Co has disclosed that the failure of the turbine generator of the Experimental Boiling Water Reactor (EBWR) at the AEC's Argonne National Laboratory resulted from excessive stress at a notch in a blade root. Seems that close study of manufacturing procedures showed that one of the *clamps used to hold the blade for machining had been incorrectly adjusted,* causing the notch. There was no evidence of stress corrosion or other forms of surface attack, nor were the blades affected by steam from the reactor.

Fast fluorescence . . .

Fluorescent colors and luminous paints can be made faster to light and less impervious to the effects of weather by adding benzo-phenon substituents which absorb ultra-violet rays. Recent experiments have shown that coloring matter can be made durable for up to at least eight months. Efforts are underway to increase this time to a year or more. Most satisfactory binders used so far are alkyd resins.

Japanese honeycomb . . .

Japan's Ministry of International Trade and Industry has approved license agreement for production, in Japan, of "Aircomb," a lightweight, honeycomb structure of paper impregnated with phenolic resin. License is between Douglas Aircraft Co (Japan) Ltd and the Hokkaido government, which will set up a plant.



bearing life boosted from

THREE WEEKS TO FOUR YEARS

with Texaco Cleartex Oil

Tyson Bearing Corp., Division of SKF Industries, Massillon, Ohio, extended the life of micro-centric grinder bronze sleeve bearings from 3 weeks to 4 years (and they're still going strong) using *one* oil—Texaco Cleartex B—for both grinding *and* machine lubrication.

Before Cleartex was used, machine bearings would fail in about 3 weeks, because the lubricant became contaminated by grinding oil. With Cleartex this problem simply doesn't exist. A premium quality lubricant, Cleartex is *also* a fine grinding oil. In fact, Tyson now gets as many as 20 pieces per wheel dressing, each with a better finish, compared to the 10 or 12 that were previously obtained.

You can do any machining work better, faster and at lower cost with Texaco—a complete line of cutting, grinding and soluble oils. A Texaco Lubrication Engineer will gladly help you select the right ones for your job. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write: The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

CIRCLE 274 READER SERVICE CARD

WHAT'S AHEAD... in Metalworking

TRENDS

Metalworking heading into active fall

Things are looking up as the metalworking industry heads into the fall season. Orders in many segments are better than anticipated. And production in the fourth quarter promises to be higher than the experts predicted even a month ago.

Take some of the heavy products. New orders for industrial furnaces have been the best in 10 months. Nevertheless for the year the dollar volume is only half what it was last year.

The industrial material handling business has taken a decided turn for the better, the Material Handling Institute Inc reports. Bookings have been the largest since May 1957. And the outlook for continued increases in equipment sales is brighter than at any time since the slideoff began more than a year ago.

Material handling sales in the second quarter averaged 123 on the Institute's index, compared with 95 the previous quarter. The gain is sure to continue.

Manufacturers of machinery and industrial goods are forecasting a pickup in orders. They expect that the McGraw-Hill Machinery New Orders Index will go from 127 in the third quarter (1950=100) to 141 in the fourth quarter, to 149 in the first quarter of 1959, and to 156 in the second quarter. Construction and mining machinery makers and the office machinery people are particularly optimistic.

Companies in such lines as pumps and compressors, engines and turbines, and metalworking machinery also expect better times ahead.

Power tool orders in July reversed a seasonal trend of long standing and ran 25% ahead of June. More than that, the gain has held. The upswing is attributed to improvement in the construction industry, better confidence in industry as a whole, and urgent demand for additional school workshop facilities.

The steel industry reports that auto companies are buying steel at a surprising rate, in view of a threatened strike. At least one prominent mill states that the last two weeks of August were as good as any two weeks this year. And it figures that September will be better.

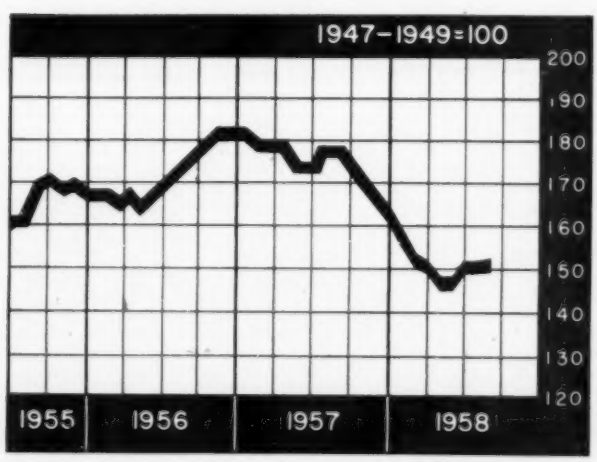
For the first time this year, one steel maker reports bookings for cold-rolled sheet at 100% for the following month.

Appliance manufacturers are buying steel at the best rate in six months. Construction and farm machinery companies also are buying strongly. Certain steel mills say privately that they are beginning to have trouble making deliveries in cold-drawn bars.

Auto makers appear to be feeling their way cautiously into the new model season, what with a possible strike ahead. They are keeping down orders for parts. One independent parts company, typical of all, is shipping for 1959 models at a slower pace than last year. But it must maintain a fair stock because if the strike does not come off and a good market for cars develops, car makers will step up schedules quickly.

Orders for electronic products are putting new life into the commercial stamping industry.

Sales of stampings in June were up 35% from May, and July maintained the July pace. A Pressed Metal Institute survey shows 23% of the stamping shops expecting a marked improvement the next three months.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

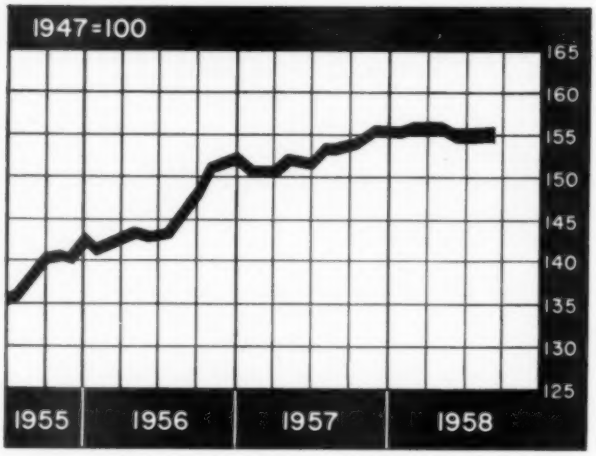
	AUG. Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total Index	**153**	**154**	**151**	**177**
Machinery	126	125	152	
Electrical Machinery	178	171	214	
Autos	83	88	118	
Other Transportation	366	352	371	
Other Metalworking	134	132	147	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	AUG Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total Index	**155.8**	**155.8**	**155.9**	**153.4**
Metalworking Machinery	**181.2**	**180.9**		**177.4**
Other Machinery exc. Electrical	**166.0**	**166.1**		**161.4**
Electrical Machinery	**158.9**	**158.9**		**155.6**
Fabricated Metal Products	**146.2**	**146.3**		**144.0**

155.8



Economy again heads for record high...

Business recovery, under way since spring, should move into high gear in fourth quarter.

Gross national product, the value of all goods and services produced by the economy, stands a good chance of again reaching $445 billion—the all-time high attained last summer—in the final quarter. Here are the main factors which give a bright coloring to the end-of-the-year outlook:

Businessmen are operating less and less off the shelf, more and more out of current production. The record inventory liquidation of the first quarter has slowed markedly. And by the end of the year business may again be building up inventory.

Homebuilding—which has given the economy a real boost recently—should continue to gain speed this fall. Thanks chiefly to a revival in home construction financed with government-backed mortgages, housing starts this summer have reached their highest totals in two years. And since the demand for government-insured mortgages has continued to mount, the home-building boom is likely to continue into 1959.

Government spending—federal, state and local—will continue to rise. Increased defense spending and a high level of public construction are the key factors here.

Consumer income and spending both dipped last fall and winter but are again running at record levels. Both will continue to rise at a substantial rate. If, as seems likely, the buildup in income has restored confidence, consumers can be expected to resume their purchases of the big-ticket items they shied away from during the recession. And heavier spending on durables—particularly the 1959 autos being introduced this fall—would give a major lift to business, too.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	134.6	137.8	145.5
Steel ingot production (thousand tons)	1,717	1,690	2,103
Electric power output (million Kilowatt hours)	12,846	12,851	12,023
Production of automobiles and trucks	38,088	75,687	149,866
Engineering construction awards (Eng. News-Record, millions)	$ 397.8	$ 373.0	$ 436.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	316	263	305
Vacuum cleaners sales (thousands of units)	253	219	207
Washers sales (thousands of units)	289	263	289
Household electric ranges sales (thousands of units)	64	53	66
Radio production (thousands of units)	774	655	1088
Television production (thousands of units)	377	267	544
Gear sales index (1947-49=100)	NA	173.8	211.4
Foundry equipment new orders index shipments, 1947-49=100)	NA	136.1	98.6

* Seasonally adjusted

CIRCLE 275 READER SERVICE CARD▶

Lightning fast speed change

a money making virtue!

This time saving feature of "AMERICAN" Pacemaker Lathes appeals strongly to operators who acclaim it a real money maker for them.

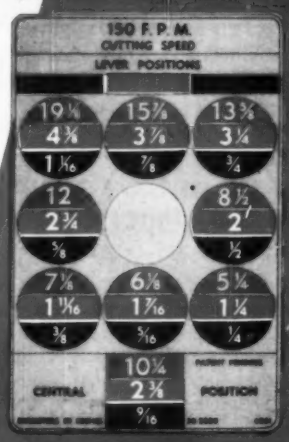
The speed plate is direct reading and shows at a glance the available spindle speeds and how to secure them. Operators can't go wrong. So fast, so easy to read and so simple that they do not hesitate to make speed changes to secure correct cutting speeds.

In addition, cutting speed snap-on plates are available indicating the lever positions for cutting various work diameters at the selected feet per minute cutting speed. These plates may be quickly applied and changed for the desired cutting speed.

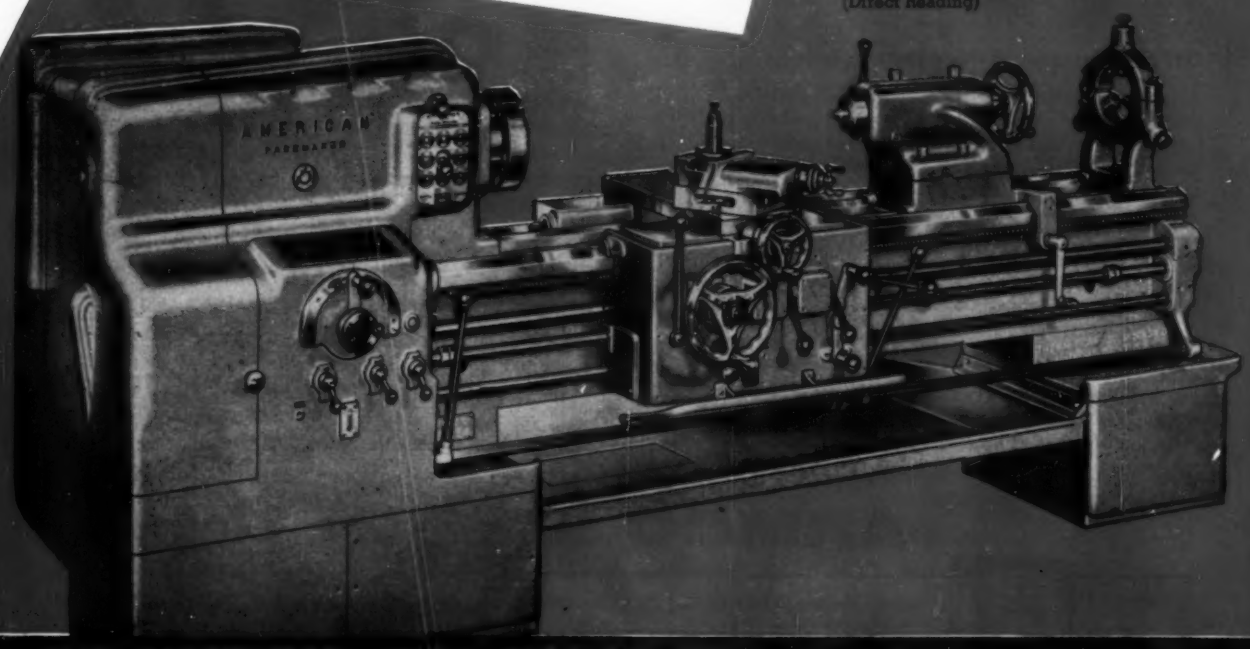
No system for securing cutting speeds could be simpler, faster or less expensive in first cost and maintenance.

- *These and other fine features of the "AMERICAN" DeLuxe Model Pacemaker are illustrated and described by Bulletin No. 116.*

Spindle Speed Plate (Direct Reading)



Cutting Speed Plate (Direct Reading)



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio; U. S. A.

LATHES AND RADIAL DRILLS

Armco ALUMINIZED STEEL Tubing Cuts Cost of Appliance Parts for Manufacturer

Venturi tubes for gas ranges made of Armco's hot-dip aluminum coated tubing provide resistance to heat and corrosion at less cost

Lincoln Brass Works, Inc., Detroit manufacturer of appliance components cut the cost of gas range venturi tubes by using Armco ALUMINIZED STEEL Type 1 Tubing instead of plated or ceramic coated steel tubing.

The company switched to Armco's special tubing after making a detailed engineering and cost analysis of materials acceptable to AGA for the application. Their tests showed that ALUMINIZED STEEL Tubing assured ample corrosion- and heat-resistance for dependable durability, and made possible appreciable cost reduction.

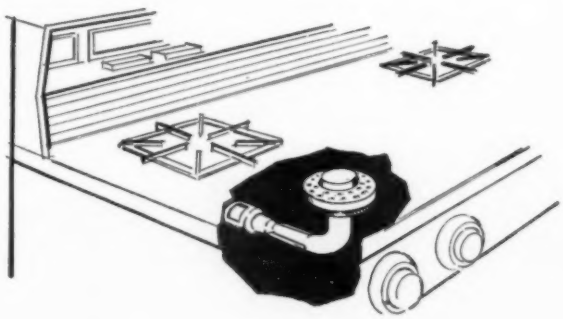
Offers Unique Advantages

Armco ALUMINIZED STEEL Type 1 Tubing gives you all the advantages of light weight tubular construction plus top resistance to a combination of heat and corrosion. Its special coating won't discolor up to 900 F, resists destructive scaling to about 1250 F.

Because of these advantages, unmatched by any other metal tubing in its price class, ALUMINIZED STEEL Type 1 Tubing is widely used for heating elements; truck, tractor and automobile exhaust systems; heat exchanger tubes; flash tubes and similar parts.

Give *your* products an edge on competition with the design-improving and cost-cutting possibilities of Armco ALUMINIZED STEEL Tubing. It's available in O.D.'s from 3/8 to 3 inches, gages from 13 to 20, and special shapes.

For complete information on properties and available sizes, just fill out and mail the coupon.



New steels are born at Armco

ARMCO STEEL CORPORATION, 2518 Curtis St., Middletown, Ohio

Send me complete information on Armco ALUMINIZED STEEL Tubing. We are considering it for_____

NAME _____

COMPANY _____

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ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Practical Help For Your Schools

Everybody has been talking about what to do to make our educational system better.

Emphasis has rightly been on more teaching of mathematics, science and engineering, without neglecting the liberal arts. There is a commendable stress upon higher standards of teaching and upon expecting more from students.

Industry has been urged . . .

to lend its financial support to colleges, partially by setting up scholarships. And, in fairness, it should be said that industry is rising handsomely to the occasion.

All of this is to the good. But in our eagerness to enlarge and strengthen our system of higher education let us not overlook our vocational schools and two-year technical colleges.

Too often these schools and colleges are an after-thought in the minds of our educators, our public officials and our industrialists. They evidently have no place at all in the thinking of the great private foundations, like the Ford Foundation.

Yet what are the facts? Too often vocational school teachers feel that they are at the bottom of the educational organization chart, and too often they are—poorly paid, looked down upon, put over in a corner to shift for themselves, given inadequate equipment with which to work.

The inadequate equipment . . .

partly consists of the pupils themselves. The authorities in too many cases regard the vocational schools as a sort of dumping ground for below-average boys.

What a disastrous and ill-conceived approach to what should be a grand educational opportunity! What a pushing aside of facts in favor of more glamorous pursuits!

If ever American industry needs well-trained shop men and technicians, it will be in the expansionist 1960's. We must have enough graduate engineers and scientists, to be sure. But they in turn must have the solid support of large numbers of skilled workers and technicians (who are capable of doing many of the tasks now assigned to engineers).

"None of us would discredit the importance of mathematicians and scientists to our modern technology," one observer comments, "but very few things would get off the drawing board, much less off the ground, if it were not for the skilled workers and technicians."

How true, you say . . .

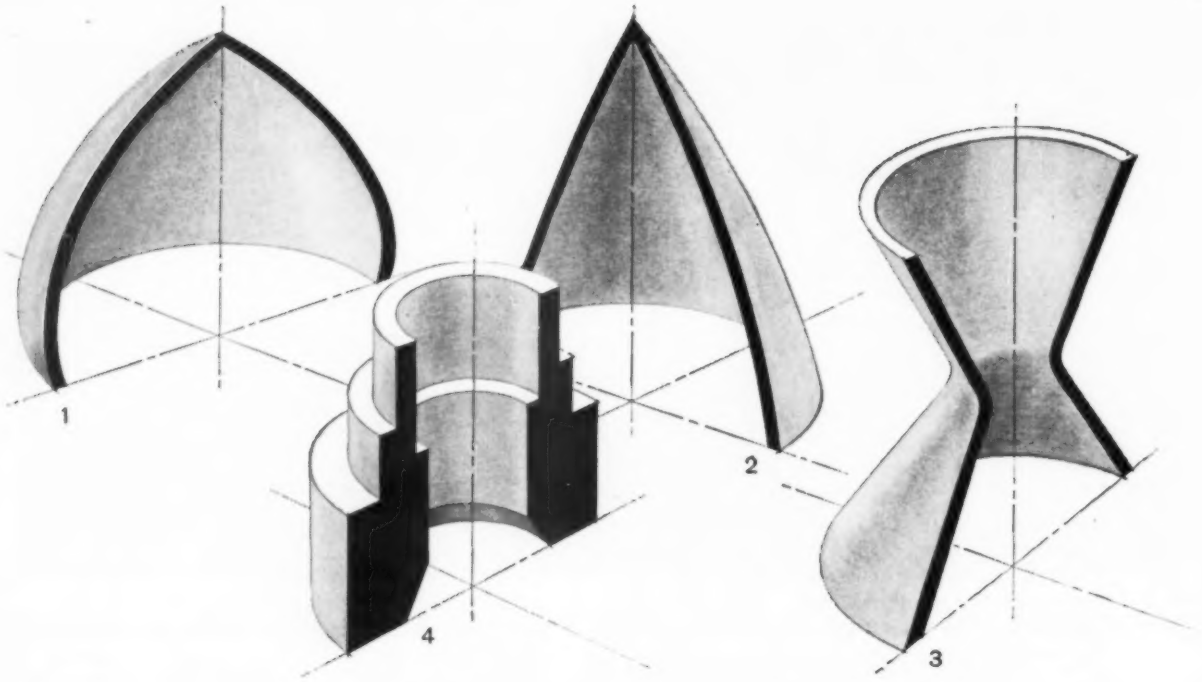
But it is of little help merely to give lip service to this principle. Our vocational schools and technical colleges badly need your support, both financial and moral.

Get acquainted with the teachers and the principals and let them know that they can count on you. Make your views known to the school boards and the college trustees and the superintendents and deans.

Lend your influence to a program of adequate salaries, adequate classroom facilities and adequate (which means up-to-date) equipment. See that your company financially contributes to the kind of program that you advocate.

This kind of practical help on the local level can do immeasurable good. Selfishly, it is the best thing that you can do to insure yourself against a future shortage of skilled shop men and technicians.

Burnham Finney EDITOR



how to Vertical Grind missile shapes

Complex missile shapes such as these, weighing hundreds or thousands of pounds, can be ground accurately on a Springfield vertical contour grinder. These machines are equally at home grinding ceramics, plastics, metals or combinations of materials. Domes (1) of any shape or Cones (2) demanding extreme concentricity can be contour ground on a Springfield. Ceramic coated parts (3) or complex orifices (4) are naturals for grinding on a standard Springfield vertical.

If your missile shapes, *no matter what size,* require contour grinding or have taper holes, irregular holes, offsets, undercuts or angles—we'd like to show you how the Springfield principle of vertical grinding can work for you. Mail the coupon today, for your free and informative copy of "Vertical Universal Grinders"; Bulletin 197-E.

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

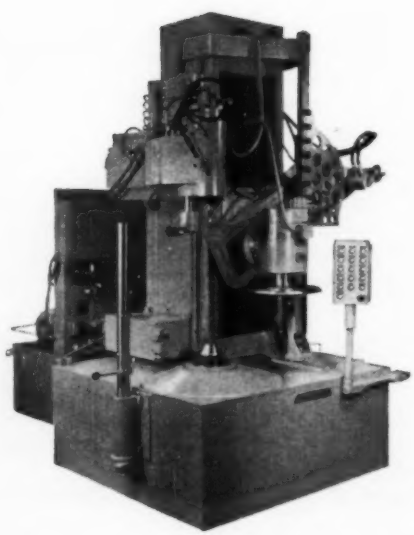
SPRINGFIELD

name & title _____

company _____

address _____

city, zone, state _____



This machine accurately grinds a compound-curve dome. Both the grinding wheel and a single point tool follow a precision template. Automatic parting tools remove excess stock, top and bottom.

Verdict on European ceramics: "Good"

Ceramic cutting tools from Sweden, Germany, France, and Holland are similar to US tools and cut almost as well, according to tests made by Warner & Swasey Co. European ceramics are late starters—developed some time since the original '55 announcement by Watertown Arsenal —but two of four samples checked out almost as well as a standard US ceramic bit, one was quite poor, and one was slightly better, judging by total metal removed at the test setup.

The imported ceramics are ½-in.-sq bits, but with thicknesses ranging from 3/16 to ⅜ in.—standard US thickness is 3/16 in. Sample imports were ground down to fit standard toolholders so all cutting tips would be under identical conditions. Tool geometry was 15° side cutting-edge angle, 15° end cutting-edge angle, negative 7° side and back rake, and nose radii of various sizes, depending on the manufacturer's standard.

Tests on 6-in. dia bar stock

Two tests were made on 6-in.-dia bar stock (SAE 4150 at Brinell 167-223) cut to 10-in. lengths and chucked so turning length was 7 in. This provided sufficient rigidity to eliminate vibration. One test was made at 950-1000 sfpm with depth of cut at ⅛ in. and feed of 0.011 ipr. The second test was at 1575-1650 sfpm with 1/16-in. depth of cut and the same feed. All bars were turned and faced before the tests to remove scale and eccentricity. See results in accompanying charts.

The tests indicate that, although European tool manufacturers have gotten into the field at a later date than US ceramics makers, they have achieved respectable results. The third chart shows some of the original test data that lacked consistency. Evidently the nose radius, land width, and depth of cut have interdependent influences on tool life. According to Robert T Hook, chief metallurgist, Warner & Swasey Co, the nose radius as well as the side cutting edge angle has considerable effect.

Many of these tools are available in several sizes, and in colors ranging from white to black. It is believed that the Dutch tools were actually manufactured in France.

Comparative performance of U S and foreign ceramics

TEST I: Depth of cut 0.125 in. Feed: 0.011 ipr. Speed: 950-1000 sfpm

Ceramic	Nose radius	Land honed from vertical plane	Cu in. removed	Tool Life in actual minutes
European #1	0.060	60° x 0.030	315.8	19.0
European #2	0.090	65° x 0.030	576.8	33.6
European #3	0.090	60° x 0.030	74.2	5.2
European #4A	0.090	60° x 0.030	388.5	24.8
European #4B	0.090	60° x 0.030	474.3	33.65
American #1	0.090	60° x 0.030	494.2	29.6
American #2	0.115	70° x 0.020	509.9	32.64

TEST II: Depth of cut 0.0625 in. Feed: 0.011 ipr. Speed: 1575-1650 sfpm

Ceramic	Nose radius	Land honed from vertical plane	Cu in. removed	Tool Life in actual minutes
European #1	0.060	60° x 0.030	123.5	9.12
European #2	0.090	65° x 0.030	324.0	23.93
European #3	0.100	60° x 0.030	42.0	3.13
European #4A	0.090	60° x 0.030	444.0	33.05
American #1	0.115	60° x 0.030	250.0	18.47

TEST III: speed 950-1000 sfpm

Ceramic	Rake	Nose radius	Land honed from vertical plane	Depth of cut	Feed (ipr)	Cu in. removed	Tool life in actual minutes
European #3	Neg 5° & 5°	0.036	60° x 0.005	0.062	0.015	17.3	2.8
European #3	Neg 7° & 7°	0.090	60° x 0.030	0.125	0.011	74.2	5.2
American #1	Neg 5° & 5°	0.025	60° x 0.005	0.0625	0.015	86.7	14.8
American #1	Neg 7° & 7°	0.090	60° x 0.030	0.125	0.011	494.2	33.6

Free-piston locomotive will debut soon

Sometime in the next few weeks, America's first free-piston locomotive will take to the rails. It is now in the final assembly stage at General Motors' Electro-Motive Division, La Grange, Ill. Resembling a diesel locomotive, except that is 8 ft longer, the new unit has two opposed-piston free-piston engines of 1000 hp each —an adaptation of France's Sigma engines. It has a compression ratio of about 30 to 1.

Whether or not the free-piston locomotive will ultimately replace the diesel is a moot question. For one thing, diesels have improved greatly while the new engine was being developed, diesel fuel isn't scarce anymore and the free-piston engine is a lot noisier than a diesel.

Boss's paycheck reflects profits squeeze, survey finds

Recession in general and the current profits squeeze in particular have apparently clamped the lid on salaries and other compensations for top-ranking executives in metalworking and other industrial fields.

A survey of 647 leading U S firms in 18 major industrial classifications, undertaken by McKinsey & Company Inc, management consultants, and slated to appear this month in the *Harvard Business Review*, shows that the average increase in compensation for chief executive officers (generally either the board chairman or president) was 0.1% in 1957, compared with increases of 5.1% and 6.3% for 1956 and 1955. Average compensation for a chief executive officer in the surveyed companies (and it must be remembered they are among the country's biggest) was $108,000 in 1957.

In reporting on the Heavy Machinery portion of the survey, Jonathan Lynch, McKinsey Associate, noted that heavy machinery chief executive officer compensation is much more sensitive to changes in profit than it is to changes in sales volume. When sales went up and profits dropped, eight out of ten chief executives either received no increase in compensation from 1956 to 1957 or had a decrease in compensation. When sales went down, and profits up, chief executives either held their own or received increases.

$93,000 Average Pay in '57

In the Heavy Machinery category (machine tools, ordnance, industrial heating equipment, presses, materials handling, electrical machinery, etc.), the chief executive officer received an average compensation of $93,000 in 1957, something like 14% less than the 18-industry average.

In 1957, 37% of the chief executive officers in the heavy machinery industry received increases in compensation, compared with 43% in the 18-industry group (which includes heavy machinery); 35% received decreases compared with 18-industry's 27%; and 28% stayed the same, as did 30% of the 18-industry group.

It was found that as the size of a heavy machinery company increases (as measured by net profits), the chief executive officer makes a progressively worse financial showing than his counterpart in other industries. For instance, at the $3 million net profit level, the heavy machinery top executive ranked seventh by comparison with the other 17 surveyed industries; at $10 million, tenth; and at $40 million, fifteenth out of 18.

In actual figures, chief executives of heavy machinery companies at the $3 million level averaged $84,000 in 1957, $82,000 in 1956, $76,000 in 1955, and $74,000 in 1954. In the $10 million annual profits bracket they averaged $106,000 in 1957, $105,000 in 1956, and in 1955, and $107,000 in 1954. In the $40 million bracket, the average was $138,000 in 1957, $200,000 in 1956, $153,000 in 1955, and $160,000 in 1954.

Pay of Other Executives

When compensation is figured as a percent of the CEO's, second, third, and fourth ranking executives in the average company in the heavy machinery industry did well by comparison with the 18-industry average, ranking in the upper half for 1957.

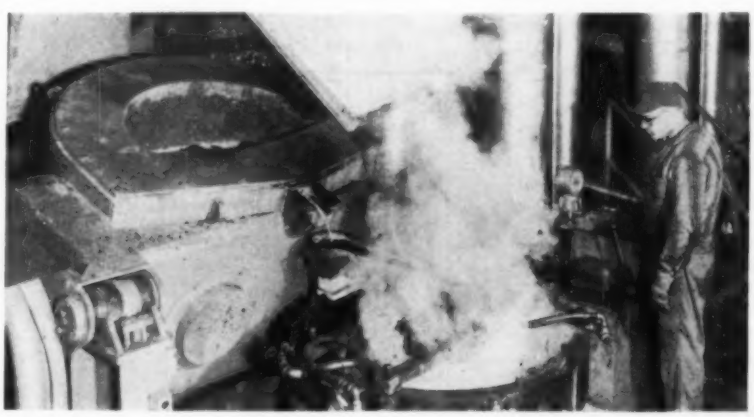
The Number Two man in the 18 industries averaged 69% of the chief executive officer's compensation in 1957, down from 70% in 1956. The Number Two man in the average heavy machinery company also made 69% of the chief executive's compensation in 1957, but his relative income dropped significantly from 74% in 1956.

The Number Three man in the 18 industries averaged 57% of the top boss' income in 1957—about the same as he did in 1956. His counterpart in heavy machinery earned 59% of the top executive's compensation in 1957, 1956, and 1955.

The Number Four man in the 18-industry average earned 52% in 1957, up 1% from 1956, while in heavy machinery, the relationship held steady at 52% for both years.

Wide Variance in Pay

Although the average compensations of second, third and fourth ranking executives were close to the norm for the 18 industries, the spread between high and low for each position varied widely. For instance, although the Number Two man averaged 69% of the chief executive's compensation, the high was 100% and the low was 40%. Similarly, the Number Three executive averaged 59% of the boss' compensation, but in one case made 96% and in another 31% of it. The Number Four man, earning a mean of 55% of the CEO's compensation, ranged as high as 88%, as low as 27%.



Continuous casting of copper and brass

Said to be an industry "first" is this continuous casting installation at American Brass Co's Ansonia, Conn, Division for extruding billets and rolling mill slabs. Setup comprises a series of casting machines built by Lobeck Casting Processes Inc, New York, each fed with liquid metal from Ajax electric induction furnaces. Machines produce multiple-strand extrusion billets up to 8 in. dia, rolling mill slabs up to 6 in. x 24½ in. up to 12 ft long

Single-crystal ingot is sliced . . .
by diamond saw on grinding machine. Wafers sliced off may be as thin as 0.02 in. Power downfeed is applied to minimize stresses and chance of chipping. Machine hood has been removed to allow photograph

Precision machines slice and dice transistor elements

Ultra-small pieces of germanium, silicon, and other semiconductor materials are machined and finished with careful laboratory techniques. Here are examples of how Bell Telephone Laboratories produces some of industry's smallest mechanisms . . .

By Charles Emerson, associate editor

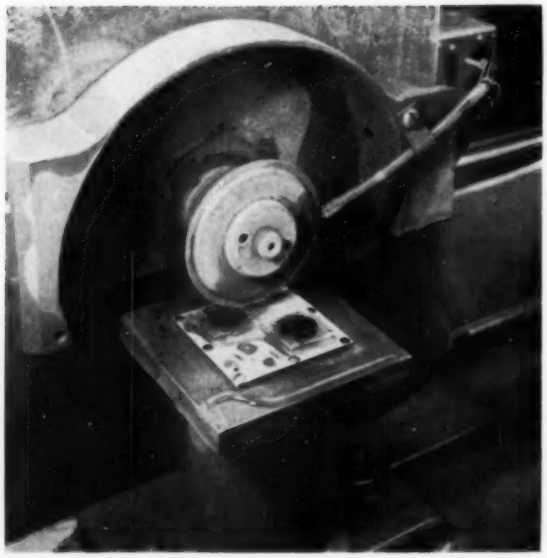
Ten years of manufacturing development since the first transistor was announced has dropped the price from $21.50 for the early hand-assembled devices to as low as $1.50 today. Improved methods of cutting and finishing the unusual materials, which are hard and brittle, include:

- Slicing thin wafers from a single-crystal ingot with diamond saws
- Dicing the wafers into tiny squares of material with a single or ganged saws
- Lapping and polishing the faces of the wafers and dice to a high accuracy
- Ultrasonically machining the dice faces to produce special shapes

Bell Labs does no commercial manufacturing, but fair-size quantities of transistor elements are required for research and development on new types and new versions of existing transistors. Production techniques are therefore not as mechanized as in commercial industry, but there are similarities.

Precision machines . . .

Wafers are lapped on both sides . . .
for high finish and thickness accuracy. Plates are waxed, heated on hotplate to melt wax so it will grip wafers, then located on lapping machine. At least 0.005 in. of stock is removed on each side



Wafers are diced . . .
to produce small squares and rectangles of silicon semiconductor. Saw is diamond-impregnated wire mesh, which holds flatness and concentricity, and can be charged with diamond particles. Machine hood is removed for photo purposes

Touchy Materials

Small part size and brittleness cause some fabricating difficulties, so slicing and dicing saws must operate at high speeds (4500 sfpm) and slow feeds (down to ¼ ipm). However, the slow cutting rate is no particular problem in transistor fabrication because a single slicing machine at the laboratories can supply enough semiconductor wafers for experimental units for all departments requiring them. A large number of transistor elements can be diced from a single wafer, so quantities multiply rapidly.

Slicing, Dicing, Lapping

Transistor elements must be cut on their crystal plane. For this reason each single-crystal ingot is examined by X-ray so the crystal plane can be aligned when the ingot is cemented to a glass plate that holds it for slicing. A shellac-base adhesive grips it to the glass, which is supported by a brass plate on a grinder table.

The ingot, 3—4 in. long and ¾—1 in. in dia, is cut into slices as thin as 0.020 in. by a metal wheel loaded with diamond grit. Saw thickness is usually 0.035 in, which is a compromise between saw rigidity and waste of valuable raw material. Slow-moving powered downfeed is applied by the grinder head to the slicing saw.

The wafers produced by slicing are lapped and polished to any degree of finish required by end-use demands. First lapping is done with aluminum-oxide abrasive and castile soap-water carrier, which provides good wetting and simplifies cleaning. Accuracy is to 0.001 in., with at least 0.005 in. of stock removed from each side of the wafers.

Wafers are lapped on round steel plates. They are mounted by heating a small hotplate, adding wax, then pressing the wafers firmly into the wax. A weight is placed on top as the wax cools and sets.

Finer polishing is often necessary, especially when the transistors are for high-frequency applications. Small element size and high finish are two of many controlling factors that contribute to high-frequency capability. Standard industrial or optical lapping machines are operated with aluminum-oxide or diamond-dust abrasive applied by silk- or nylon-covered lapping disks. Wafers are sometimes taken down to 0.00137-in. thickness for special devices, but are more commonly lapped to 0.003-0.004-in. thickness. Tolerances of 0.002 in. are usually held.

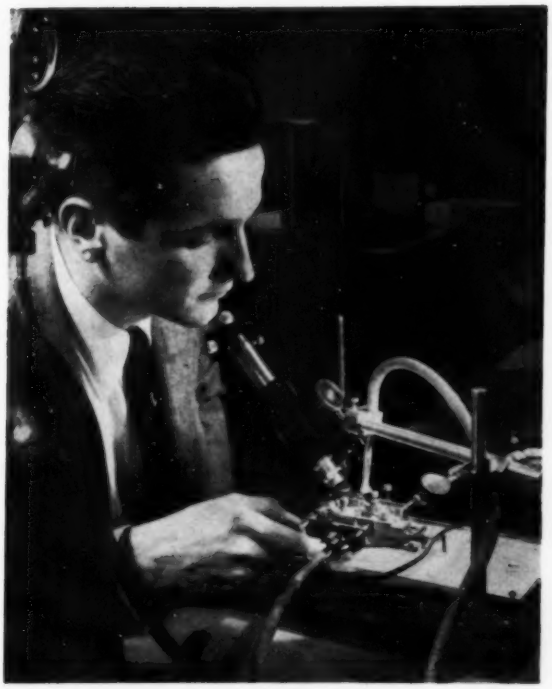
When wafers are to be diced by saw, they are remounted with wax on a brass-supported glass plate and covered with another layer of wax and a thin laboratory specimen glass. The cover helps prevent edge chipping. Dicing is done with wire-mesh diamond saws, singly or in gangs, to produce rectangles or squares as small as 1/16 in. on a side.

Magnetostriction

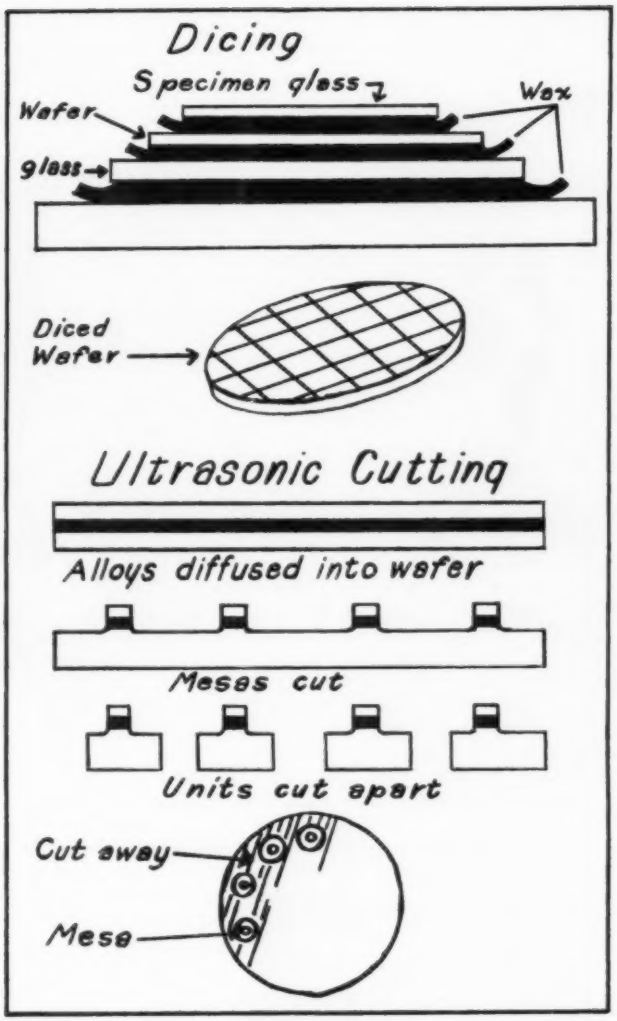
Ultrasonic techniques are also applied to cut wafers into small dice. One transistor device requires an extremely small active area achieved by cutting a mesa or plateau shape into the top surface of the wafer. An ultrasonic toolholder is equipped with a replaceable form tool that cuts several circular mesa shapes into a wafer face. These are usually about 0.005 in. across and about the same height when completed. A second forming tool then makes circular cuts around the mesa shapes to form bases 0.025-0.030 in. across. The circular base with its mesa on top is then the active element in the special transistor or diode. As many as 80 such "circular dice" can be cut from a single wafer.

Square dice can also be cut ultrasonically if there is any particular reason to avoid sawing—danger of chipping, etc.

After machining, the small pieces of semiconductor are attached to bases, wires are fastened to active areas on the element, and the transistors are enclosed and hermetically sealed. All assembly operations must be done under critically clean conditions because contamination might ruin an otherwise perfectly good device.



Transistors are wired with microscope . . . which allows placing contacts in active areas. Positioning stage has micrometer adjustments in three axes; was built by experimental transistor models laboratory



Semiconductor machining . . . depends on work setup, sharp tools, and accurate location. Before mesa elements are cut ultrasonically, alloys are diffused into top surface of the semiconductor material to produce NPN or PNP structure. Then ultrasonic tool cuts mesa to below level of second layer, to expose active areas

Branch Shops Build Equipment to Order

Scientists and engineers working with new and untried devices can get quick service on models, tools, and handling devices because Bell Laboratories has established a system of specialized branch shops. These do one- or two-day jobs without detailed blueprints and with a minimum of paperwork, concentrating on the special requirements of the laboratory branches to which they are attached.

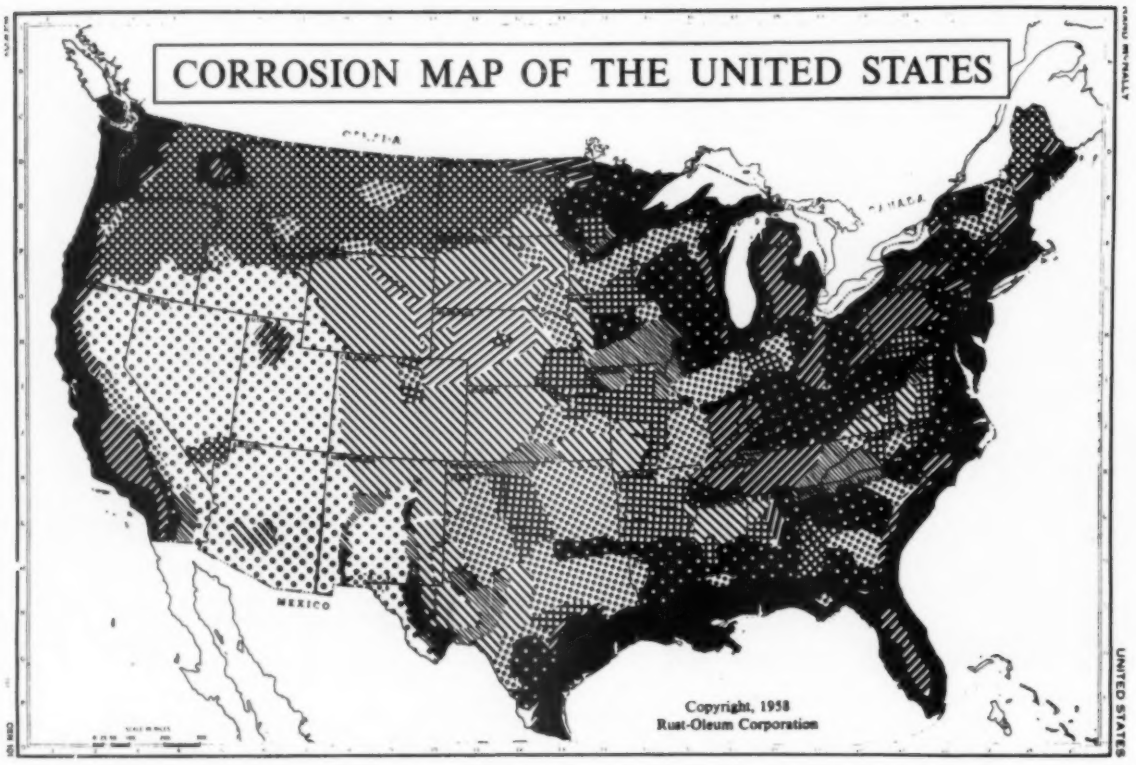
There are 22 branch machine shops and two wiring shops, each averaging three or four men and space amounting to three 6-ft bays. Normal equipment is a small lathe, a miller, drillpress, sheet-metal equipment, and sufficient supporting bench space for normal hand work.

Work is ordered informally: "Make three wheels as per sketch," or "Cut four lengths of ⅜-in. brass rod, 12 in. long." This supplies the immediate simple needs of research personnel. More difficult and longer jobs go to the main shop, accompanied by detailed blueprints and complete instruction. If the shop planning group so decides, a job may be sent to an outside supplier or specialty contract shop when the main shop is overloaded.

With this setup, experimental work can often be handled without the usual difficulty with trying to buy or adapt commercial equipment to do special work. Time and trouble is saved on the quick jobs, and the central shop can work on detailed, complex projects.

The central shop also serves as training ground for the company's own apprentice program, which turns out skilled "instrument makers" after a four-year course. Apprentices sign contracts to complete the course, but are not held to work at Bell unless they so desire. About 18 apprentices are in training at Murray Hill at a given time.

Attached to the central machine shop are also facilities for plating practically any metal, printed-circuit shops, and metallizing, painting, and wiring facilities for complex assemblies.



Legend

The number of years and months required to corrode an uncoated 28-gauge steel test panel to a severe degree

YEARS AND MONTHS	COLOR CODE	YEARS AND MONTHS	COLOR CODE	YEARS AND MONTHS	COLOR CODE
3.00 – 3.11		6.00 – 6.11		9.00 – 9.11	
4.00 – 4.11		7.00 – 7.11		10.00 – 14.11	
5.00 – 5.11		8.00 – 8.11		15.00 +	

Which U S city is the rustiest?

It took something like 25 years and hundreds of uncoated steel test panels the size of auto license plates to find out which of America's 523 cities of more than 10,000 population has the highest rust rate. Honors (if they can be called that) went to four cities in a dead heat: Buffalo; Erie, Pa; Miami, and Rochester, N Y—with Mobile, Ala; New Orleans; Pensacola, Fla, and Pittsburgh following close behind. It took just three years to coat a test panel with rust in the first group: three years and one month in the second group.

Those are the findings of the first Rust Index of the United States, just published by Rust-Oleum Corp, Evanston, Ill, manufacturer of rust-preventing coatings.

Slowest rust rate (more than 15 years to rust a test panel left outdoors at an industrial site) was found at Tucson, Ariz; Roswell and Santa Fe, N M. Variations in rate result from rainfall, wind, corrosive gases, sunlight and salt water to be found at each test location.

$7.5 Billions a Year for Rust

In every one of the nation's major industrial centers, the rust rate was under four years. The Rust-Oleum people estimate that the nation's rust bill is now running at a rate of $7.5 billion a year—$2 billion a year more than it was just 10 years ago.

How Test Was Made

Researchers began leaving uncoated panels of 28-gage, low-carbon cold-rolled sheet steel at key industrial locations some 25 years ago. Each was dated and examined periodically to provide data for the Rust Index. For example if a panel left at a site in Chicago took 3 years, 5 months to "rust to a severe degree," that city's Rust Index became 3.5. Philadelphia's panels took 3 years, 8 months to rust to the same

degree, thus its Rust Index is 3.8.

Of the 523 cities tested by Rust-Oleum researchers 221, or 42%, fell into Class I, meaning that test panels rusted there within four years. These Class I cities include every major U S industrial area, and most secondary industrial centers. Class II cities (where test panels rusted in four to five years) number 95. The 316 cities in Classes I and II make up 60% of U S cities of over-10,000 population.

As might be expected, those cities located on or near large bodies of water, either salt or fresh, produced the highest rust rate, while those in the arid Southwest and comparatively dry Great Plains states had a very low Rust Index.

Here, in order, are America's 50 "rustiest" cities:

	RUST INDEX Years-Months
1. Buffalo	3.00
2. Erie, Pa.	3.00
3. Miami	3.00
4. Rochester, N. Y.	3.00
5. Mobile, Ala.	3.01
6. New Orleans	3.01
7. Pensacola, Fla.	3.01
8. Pittsburgh	3.01
9. Baton Rouge, La.	3.02
10. Lafayette, La.	3.02
11. Los Angeles	3.02
12. Norfolk, Va.	3.02
13. Norristown, Pa.	3.02
14. Atlanta	3.03
15. Atlantic City, N. J.	3.03
16. Baltimore	3.03
17. Cleveland	3.03
18. Cleveland Heights, O.	3.03
19. East Cleveland, O.	3.03
20. Elyria, O.	3.03
21. Euclid, O.	3.03
22. Houston	3.03
23. Johnstown, Pa.	3.03
24. Shaker Heights, O.	3.03
25. Youngstown, O.	3.03
26. Jacksonville, Fla.	3.04
27. Portland, Ore.	3.04
28. Providence, R. I.	3.04
29. Chicago	3.05
30. Cicero, Ill	3.05
31. Lakewood, O.	3.05
32. Lewiston, Me.	3.05
33. Milwaukee	3.05
34. Portland, Me.	3.05
35. Seattle	3.05
36. Sharon, Pa.	3.05
37. Wilkinsburg, Pa.	3.05
38. Bayonne, N. J.	2.06
39. Bellingham, Wash.	3.06
40. Galveston, Tex.	3.06
41. Lackawanna, N. Y.	3.06
42. Lake Charles, La.	3.06
43. Lockport, N. Y.	3.06
44. Manitowoc, Wis.	3.06
45. Newport, R. I.	3.06
46. Newport News, Va.	3.06
47. New York	3.06
48. Portsmouth, Va.	3.06
49. Reading, Pa.	3.06
50. Warwick, R. I.	3.06

$10,000-ceiling fast writeoff bill okayed just as Congress recesses

Congress presented businessmen in general and buyers of machinery and equipment in particular with a tax break before quitting for the year.

After much pulling and hauling, the lawmakers in the closing hours of the 85th Session approved a small-business-slanted measure calling for faster tax write-offs on new production equipment.

Not Used Machinery Though

But one important proviso was missing as the bill received Congressional okay—application of the $10,000 fast writeoff to used as well as new machinery. True, this much-and-long-advocated fast depreciation measure for used machinery got farther through the Congressional mill than it has at any time in past years, but it was a last-minute casualty as the 85th Congress wound up its crowded calendar.

The whole package would save taxpayers an estimated $300 million annually by three principal means—through new rules on amortization, selective excise tax cuts and elimination of inequities through a revision of the 1954 revenue code.

Though the latter two are important to businessmen in specific instances, the biggest single break to the largest number of taxpayers will come from the new regulations regarding depreciation writeoffs on capital machinery and equipment. This is expected to produce a savings of $175 million alone the first year and benefit both manufacturers and purchasers.

This provision allows faster write-offs for tax purposes on new equipment purchased after December 31, 1957. Under it, all taxpayers are given a new depreciation deduction amounting to a flat 20% of the cost of the new equipment in the first year.

The feature is limited to purchases of up to $10,000 a year, or $20,000 in those cases where a joint husband-wife tax return is permissible. In addition to the 20% writeoffs the first year, you also can deduct normal depreciation charges on the remaining 80% of the cost in the first year and thereafter.

Here's how the provision would work for a $10,000 item of equipment with an estimated salvage of $500 at the end of a 20-year tax life:

For the first year, you can begin by deducting 20% of $10,000—that is, $2000. In addition, you then apply for regular depreciation provisions on the remaining $8000. Thus for your first year tax return, to the $2000 deduction you can add $375 if you use straight line depreciation, $800 if you use declining balance or $714 if you use sum-of-the-digits.

The remaining 19 years are figured as though the first cost were $8000.

This new deduction applies only to operating machinery and equipment—not to buildings—which have a useful life of six years or more. Since it is limited to purchases of a maximum $20,000, it represents in this respect a setback to businessmen who had high hopes earlier this year for a more liberal depreciation formula being enacted.

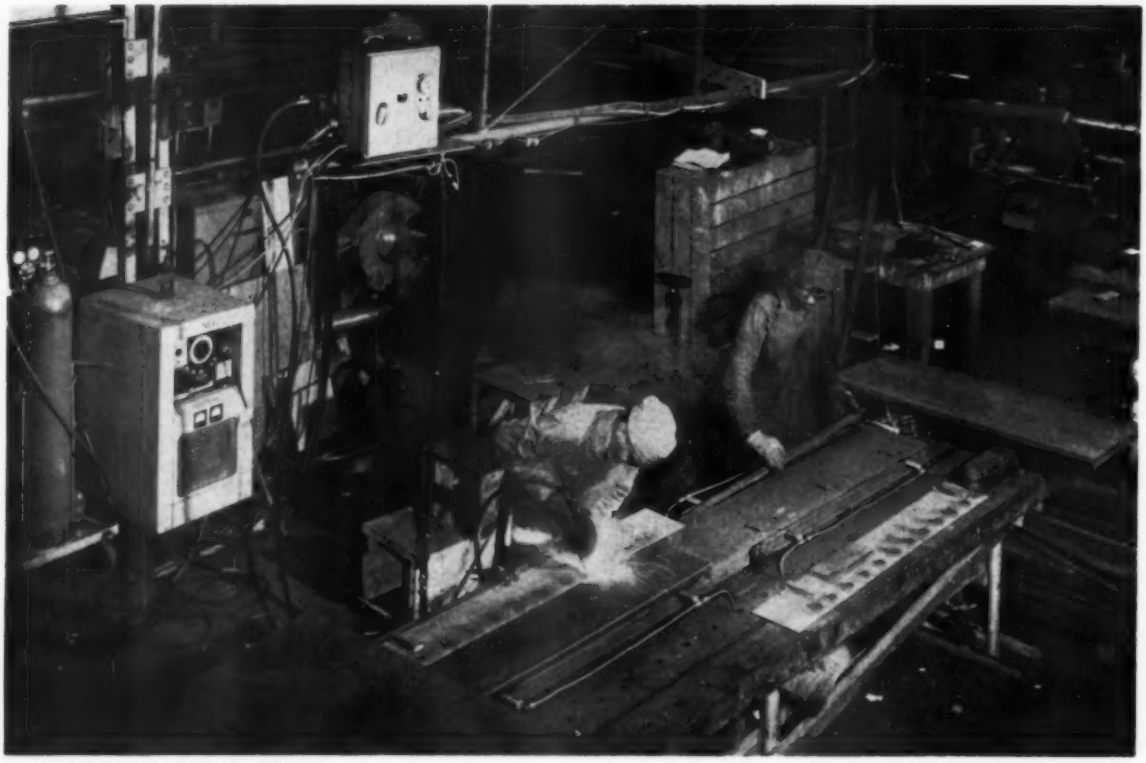
A bill by Senator Homer Capehart (R-Ind.) to this effect got a lot of attention earlier this year as an anti-recession device. It would have allowed greatly speeded up depreciation on all capital equipment purchased between January 1, 1958, and June 30, 1959. The measure was shunted aside when business began to pick up in early summer.

All other attempts to broaden the tax legislation that finally cleared Congress were defeated, including a proposal by Senator John Sparkman (D-Ala), to apply quicker depreciation on up to $30,000 in new capital investments and $50,000 in used machinery. Sparkman promises to be back next year for a try.

The new tax measures also included several other features allowing for greater depreciation write-offs. One permits the railroads to take an additional $300 million in depreciation charges on roadway equipment acquired prior to 1942 when they switched to a new accounting basis that lessened their writeoffs.

Card-programmed steel mill for Japan

Japan's first automatic steel mill, scheduled to go into production in 1959, will be controlled by Westinghouse's Prodac System, and will operate in conjunction with a hot strip mill built by Mesta Machine Co, Pittsburgh. Card-programmed roughing mill will be part of a 68-in. semicontinuous mill that holls hot carbon steel strip at 2200 fpm.



Operator makes 12 spotwelds . . .
while helper unloads the other fixture and reloads it with angle-iron stiffener, 14-ga louver blade, and locating templet

Arc Spotwelding Stiffens Louver Panels

By Richard Molthop, vice president, Vierling Steel Wks, Chicago

Manual arc welder joins angle-iron stiffeners to sheet stock by spotwelding through a drilled Transite templet. The technique replaces short-bead arc welding to eliminate sheet distortion and reduce costs without a loss in weld quality . . .

A standard wire-fed welding gun was turned into an arc spotwelding unit so we could make quick, nondistorting welds on the face of sheet-metal panels. The panels, 18 x 50-in. sheets of 14-gage, low-carbon steel, were part of an adjustable-louver ventilation system for a steel mill. Angle-iron stiffeners (1x1x⅛ in.) had to be added for strength and to support hinge pins.

But the short, regularly spaced arc welds originally specified pulled the thin sheet around the leg of the reinforcing angle, so we decided on a new method that would make the best use of available equipment. The Dual Shield consumable-electrode arc-welding unit originally installed for the job was converted for spotwelding by fitting a special nozzle to the gun and by adding a special timing control panel. Power was supplied by a 500-amp Surweld constant-voltage rectifier as before.

Two fixtures were set up so an angle iron could first be placed on a table, the sheet was added and clamped by two air cylinders, and finally a Transite templet with 12 holes was placed on top with toggle clamps. The welder could make the 12 spots almost as fast as he could locate the gun in each hole and pull the trigger. A helper set up one fixture while the welder worked at the other. Production was 50 or more louvers/hr—about 600 spotwelds.

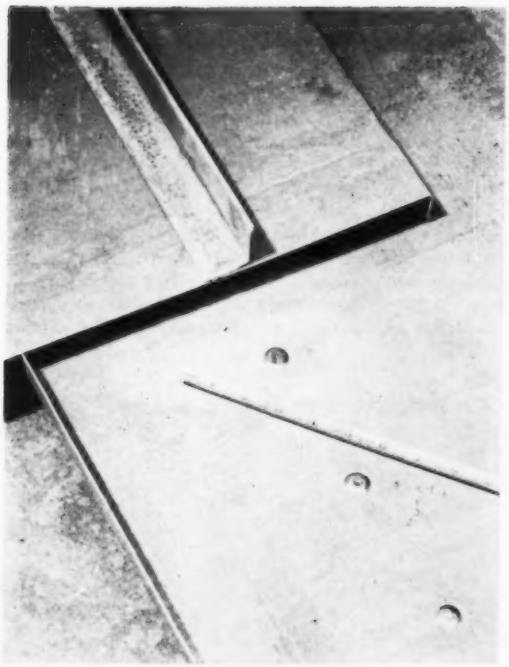
Quality was good, as proved by customer tests. More than 5000 panels were spotwelded with 100% approval of weld quality.

The welding control and wire-drive were mounted about 9 ft above the floor on a 25-ft boom, from which a 15-ft cable delivered cooling water, CO_2 shielding gas, flux-filled wire, and power to the gun. Locating holes in the non-conducting templet were large enough to let the gas entirely cover the weld area; otherwise good welds would be impossible. The electrode wire extended only a minimum beyond the gun nozzle, which also helped put the shielding gas where it was needed.

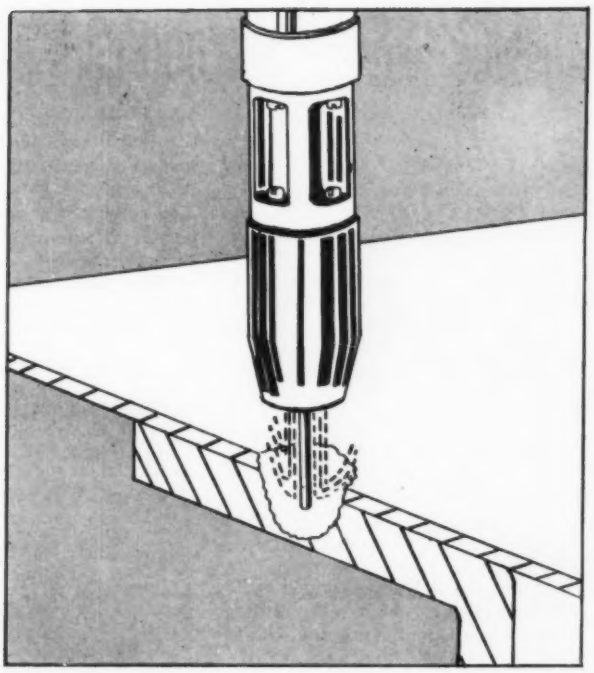
An additional feature was a heavy copper backup bar under the stiffener. Its function was to draw heat away quickly.

Cost Analysis

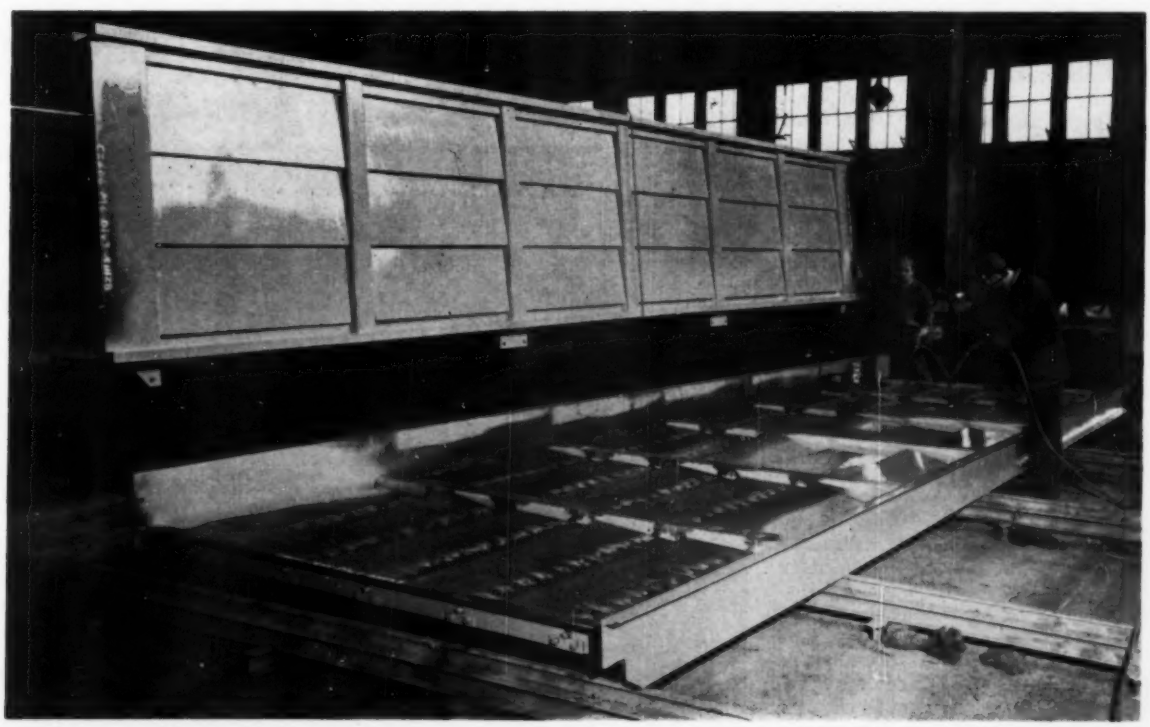
Analysis of cost records showed that each louver blade required 1 oz of flux-cored wire and about 0.042 cu ft of CO_2. This compared with ¼ lb of 5/32-in. type E-6013 electrode for intermittent arc welding, which meant that welding-material costs were cut 2/3.



Twelve spotwelds hold stiffener . . .
securely against back of 14-ga panel without causing distortion. Welds are about $\frac{3}{8}$ in. in dia, did not have to be ground off. Chisel tests showed full penetration



Portable gun makes arc spotwelds . . .
supplying flux-cored electrode wire and CO_2 shielding gas as established by timer-control panel which converted the unit from conventional arc welding



More than 5000 louver blades . . .
were assembled into several ventilator combinations and then hot-spray painted before shipment

Aussies aim for 300,000-cars-a-year output

Australia's automotive industry today is expanding so fast that demand must rise one-third over the next few years to catch up with capacity. Within a few weeks, the Australians expect to be producing at a rate of 300,000 vehicles a year—an abnormally high output in the face of that country's total (exclusive of trucks and other vehicles) registration of 148,916 new cars in 1957.

Australia today has one motor vehicle for about every four persons, making it the world's fourth mostly highly motorized country (U S is first: one car for every 2.8 persons).

While Australia has something like 100 firms in its auto industry, eight companies supply more than 90% of all vehicles marketed in Australia: General Motors Holden's Ltd, British Motor Corp (Australia), Ford Motor Co of Australia, Standard Motor Co (Australia), Volkswagen (Australia), Rootes (Australia), Chrysler (Australia), and International Harvester (Australia).

Of these eight companies, U S-owned GM Holden, Ford and Chrysler are by far the largest. They are the only Australian firms with facilities to press body panels, doing more than 90% of such work.

Body assembly (welding of panels onto the body shell) and such finishing processes as spraying and trimming are done by the U S-owned Big Three and other overseas manufacturers who operate assembly plants in the country.

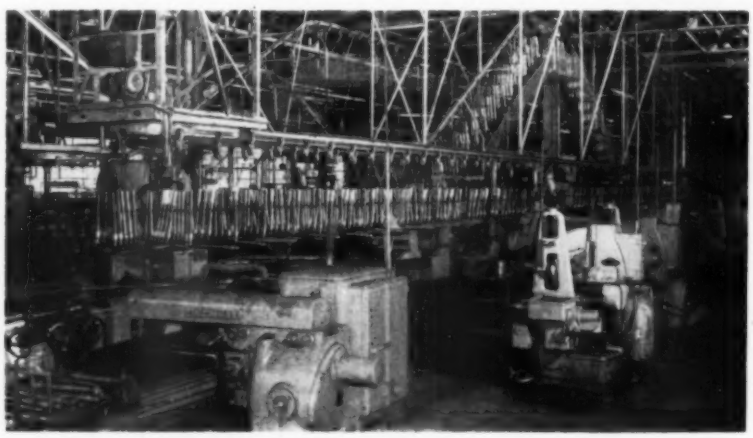
GM Holden, Australia's biggest seller, is made up of about 95% made-in-Australia parts. A high proportion of local components is to be found, likewise, in the Ford V-8, Zephyr, Consul and Prefect cars; in local Chrysler makes, and in International Harvester trucks.

British Motor Corp is now tooling up to make a car of high Australian content, as is Volkswagen.

The country's motor vehicle manufacturing expansion is centering on GM-Holden, which has a 40% share of the market. Latest expansion to be announced by GM-Holden amounts to about $25 million, bringing that company's postwar expansion total to more than $150 million. GM-Holden expects to manufacture 125,000 Holdens and 22,000 other vehicles (Vauxhalls, Bedfords, Chevrolets, Pontiacs) a year after its upcoming expansion.

Ford of Australia has been established for several years at Geelong, a seaport outside Melbourne. Australian content is more than 60% for its English designs (Consul, Zephyr), almost 80% for these of Canadian design (Customline etc). Ford has recently acquired a 400-acre site near Melbourne for expansion.

Chrysler is spending about $3 million on expansion of its facilities at Tonsley Park, South Australia. Volkswagen has formed a new Australian company, is turning out 60 cars a day at Clayton, Victoria. Also slated for large expansions: Standard Motors and Rootes Motors, both of England. And coming into Australia with an assembly plant is West Germany's Vidal and Tempo-Werk, maker of light commercial vehicles.



Conveyor lines at GM Holden . . .
Overhead conveyor lines in the gear shop at General Motors Holden's Fishermen's Be ıd, Victoria, plant carry gear shafts between machines and on to the shop's continuous gas carburizing furnace

Precision fixtures at Ford . . .
Panels for a Customline body are held in position on precision fixtures such as this one for spot welding at Ford Motor Co of Australia's Geelong plant

THE GOSS PRINTING PRESS COMPANY
KAUKAUNA OPERATION SHEET

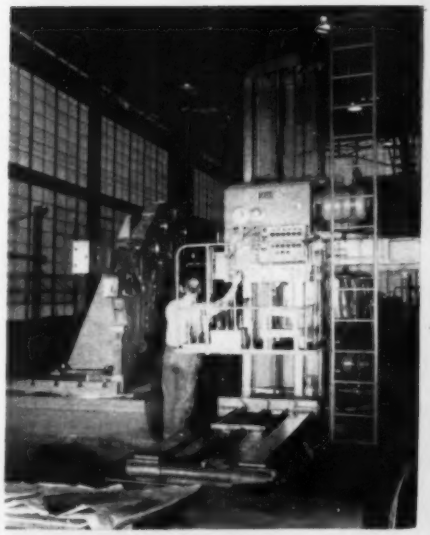
PART NAME	PRESS FRAME (DRIVE SIDE)	PART NO. 2-8059-D
OPERATION	#30-DRILL, TAP AND SPOTFACE HOLES IN ENDS, TOP AND BOTTOM. DRILL, C'BORE & PIPE TAP.	DRWG. NO. FR-9148
ORIGINAL BY	A.J.M. DATE 11-29-57	DRWG. REV. NO. 1
CHECKED BY	DATE	DATE OF REV. 5-1-57
WORK SIZE:	LENGTH 135.001 WIDTH 71½	FORMULA NO. 1

SPINDLE ZERO SETTING
HEAD 000.000 FROM TOP OF TABLE
COLUMN 000.000 22" FROM EDGE OF TABLE SIDE "W".

SET UP TIME
TIME PER PIECE

PIECE LOCATION: MOUNT OUTSIDE FACE ON 2" PARALLELS. LOCATE 46.000" DIMENSION SIDE FROM STOPS 12" OFF END OF TABLE. ALIGN BOTTOM PAD 71½" DIMENSION WITH STOPS 12" OFF LONG SIDE OF TABLE.

COLUMN AXIS	HEAD AXIS	SPEED	FEED	TOOL & SIZE	DEPTH	HOLE NO.	REMARKS
000.000	000.000						
060.500	004.750	410	.020	49/64 Drill	2¼	2	
		245		7/8-9 Tap	1⅞	2	
068.000	004.750	410	.020	49/64 Drill	2¼	4	
		245		7/8-9 Tap	1⅞	4	
074.750	004.750	410	.020	49/64 Drill	2¼	6	
		245		7/8-9 Tap	1⅞	6	



Operation sheet for Kaukauna horizontal-spindle setup . . .

Operation sheet (left) is typed in a Flexowriter from a worksheet prepared by an industrial engineer for a Kaukauna tape-controlled drill (right), providing all data machine operator needs to process a part in minimum time. Master tape (cut when this sheet was typed) later punches the machine control tape, which incorporates only spindle-head positioning dimensions (shown in first two columns of operation sheet). At right: Fine grain CI frame member for a Goss double-deck newspaper color printer on the table of Kaukauna horizontal-spindle machine is 142.5 in. long, 75 in. wide, and is as much as 6 in. thick in some sections. Frame member weighs about 3 tons. A total of 131 holes are drilled, then reamed or tapped in the two opposing faces of the part in 12.6 hr, including 2.2 hr for setup.

Tape controls cut drilling cycles 30-50%

RUSSELL L HOGIN, machine tool coordinator, and ELMER J KWETON, chief industrial engineer
GOSS PRINTING PRESS CO. Division of Miehle-Goss-Dexter Inc, Chicago

One of the first commercial applications of tape-controlled drilling is already more than paying its way after just a few months' operation at Chicago's Goss Printing Press Co.

Even though Goss's machines are not completely automatic (tapes control only the relationship of the spindle to the holes: spindles are operator controlled), floor-to-floor cycle times have been cut 30-50%.

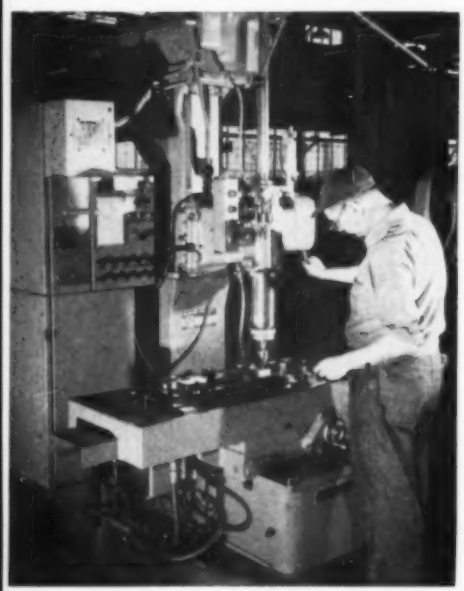
Expensive layout operations and/or drill jigs have been eliminated—an important factor in production of printing presses, which require parts in small job lots and tooling for precision drilling.

Three types of tape-controlled machines have been installed in the last year at Goss: a model 3040 Kaukauna floor-type horizontal boring, drilling and milling machine (AM Nov 4 '57 p182); a Jones & Lamson positioning table equipped with a Cincinnati-Bickford 28-in. Super-Service column drillpress; and two Burgmaster turret drilling machines equipped with Micro-Positioning tables.

Each has been a worthwhile investment—even in competition with modern, late-model drillpresses equipped with efficient jigs and fixtures. For a long time, Goss's policy has been to replace production equipment with newer models just as soon as replacements can be justified by cost reductions and/or increased accuracy. Parts for printing presses require machining to close accuracies—and this can be expensive with old, worn machine tools.

Large cast frames and brackets for printing presses, weighing from several hundred pounds to several

Tape controls cut drilling cycles 30-50% . . .



Star performer . . .

. . . in the Goss stable of tape-controlled machines is this J & L-Cincinnati-Bickford unit, which has achieved major savings on every job assigned to it since its installation last year

Preparation Sheet for Jones and Lamson Tape — Part No. 34-5679 & A

Part Name: SINGLE TRANS. ROLL ADJ. PLATE — Dwg. No.: D 12-58 ✓

Code No. _____ — Description: DRILL-DRILL & REAM — Order No. _____ For ___

X&Y Coordinates Hole No.	Dimension	Hole No.	Position No.	Cor No.	Co-Ord Y	Read 2nd Line	Zero Reset	Auto Reset	Tool Description and Size
1	X= 9.000	1	9.000	0			✓		Center drill
	Y= 5.563		5.563	0	✓	✓			
2	X= 11.375	2	11.375	0					
	Y= 5.000		5.000	0	✓	✓			
3	X= 11.375	3	8.750	0	✓				
	Y= 8.750	4	16.000	0					31/32 Drill
4	X= 16.000		7.188	0	✓	✓			1.000 ream
	Y= 7.188	4	16.000	1					19/32 drill
5	X=	4	16.000	2					
	Y=	2	11.375	3					
6	X=		5.000	3	✓	✓			
	Y=	3	8.750	3	✓				
7	X=	3	11.375	4					.625 ream
	Y=	2	5.000	4	✓				
8	X=	1	9.000	5					47/64 drill
	Y=		5.563	5	✓	✓			
9	X=							✓	Auto recut
	Y=								

Preparation sheet for J & L tape . . .

Hole coordinates for each successive operation on the Jones & Lamson positioning table are shown on this sheet, so that a clerk can hand-punch the 16-channel plastic control tape. Type and size of tool to be used in each operational sequence is indicated on the sheet

tons, are routed to the Kaukauna machine for drilling, reaming, tapping, spotfacing and countersinking operations, instead of to the radial drillpresses previously used.

This eliminates the need for layout operations, or for jigs when holes must be spaced to precision tolerances. And it cuts out handling time when parts have to be turned over on floor-plates or upended in pits. Radial drills are not required for work on end surfaces, either.

Two Sides, Two Ends, One Setup

Mounting the work on the 60 x 96-in. index table of the Kaukauna machine with accurate parallels and angle plates usually permits both sides and the two ends to be machined with only one setup. All setups are located on the index table to one of six different positioning formulas for zero locations of the "X" and "Y" axes from which the punched control tapes are calculated.

The machine provides three systems of control for locating the spindle with relation to the work (within the 96-in. vertical travel of the head and the 144-in. horizontal travel of the column along the base ways):

- **Manual control,** through pushbuttons. The spindle can be positioned to within 0.001 in. by pushbutton control of head and column movements. Each button has two positions. Depressing a button halfway provides inching travel at 4 ipm. Pushing it all the way down provides rapid traverse at 100 ipm.
- **Digital dial control.** Reading dimensional data directly from a part drawing, operator dials the head and column dimensions on digital turrets on the control panel. Depressing a "read-in" pushbutton transfers the pre-selected dialed dimensions to a visual numbered panel for checking. Then, when ready for repositioning the spindle, the operator depresses an "automatic traverse" button and the electronic control circuit causes the machine to take the shortest path to the desired position.

As the spindle nears this position, two electronic verniers indicate to 0.0001 in. the accuracy of positioning. Repeatability is within 0.001 in. While a machining operation is in progress, the operator can dial in the next dimensions.

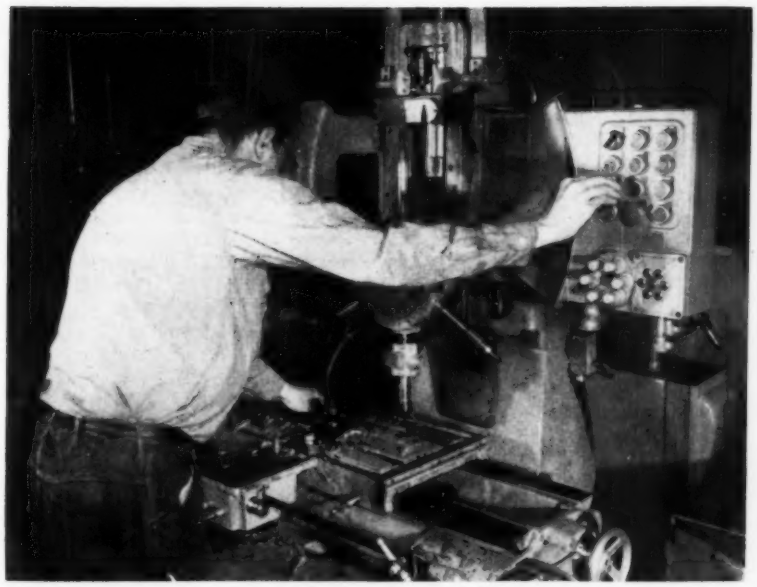
- **Automatic control** of spindle position is achieved with an 8-channel punched tape produced with a Flexowriter typewriter in the Industrial Engineering Dept's office. The tape automatically achieves the spindle positioning provided by the digital-dial control system, and does it faster.

After the tape has been loaded into the tape reader panel on the machine column, the operator depresses the "read-in" button to deliver the first block of data to the control circuits, and then depresses the "automatic traverse" button when ready to move the spindle. This sequence is repeated for each succeeding hole position.

Control of spindle speed and feed rates, machining cycles, and position and indexing of the table is done manually by the operator, using pushbuttons on the machine's control panel. These controls are separate from the spindle positioning controls, and cannot be punched into the control tapes.

When Tapes Are Best

While the digital dial control system is available for parts made in small quantities which have only a few holes to be located on each surface, experience has proved it is better to program punched tapes for the Kaukauna machine whenever more than six or eight holes must be located on a single surface. The dial controls also can be used to add a hole in a surface previously programmed on tape, while waiting for



No. 2-BH Burgmaster turret-head drilling machine . . .
. . . has Micro-Positioning table which is automatically relocated for each series of operations, employing spring-steel tapes 0.022 in. thick and ¾ in. wide, indented with spring-loaded plungers to mark points on "X" and "Y" axes. Operator positions table manually for first part, to locate control points indented on tapes. Tapes are stored for repeat jobs

a new tape to be prepared to include the new hole.

Tapes for the Kaukauna machine are programmed by an industrial engineer, who fills in a standard form to show work location on the index table (according to one of six positioning formulas), spindle location (for both column and head axes), the preferred spindle speed, feed rate, type and size of tool, depth of feed, and explanatory remarks for each hole to be machined.

Master Operation Sheet

A typist then transfers these data to a master operation sheet (see sample) in the Flexowriter typewriter which simultaneously punches a master tape from which duplicate operation sheets automatically can be retyped.

When the typed master operation sheet has been proofread for accuracy, the master tape is run through the Flexowriter to punch a machine-control tape containing only the digital dimensional data necessary for locating the spindle on the head and column axes.

The original operation sheet and the master tape are then filed for future reference. The typed operation sheet and the machine control tape go to the tool crib, and are requisitioned upon receipt of work order and part drawing at the machine.

To check the economy of tape-controlled operations on the Kaukauna machine with identical operations performed on radial drills, Goss recently drilled, reamed, tapped and spotfaced 26 holes in each of six cast-iron wall brackets in 30 hr, after having spent 3.25 hr preparing an operation sheet and machine-control tape.

Previously, this job required a total of 54.48 hr and involved four setups in radial drills. Five jig plates costing $534 were required for the radial drill setups. These were not needed on the Kaukauna machine. In addition, allowances were necessary for four crane waits per part at the radial drills, and for only one crane wait per part at the Kaukauna.

45% Savings in Time

Not counting tape preparation time (because the same tape will be used the next time duplicate parts are routed to the Kaukauna machine), machining time saved by transferring this job to the tape-controlled machine totalled 24.48 hr, or 45% of the 54.48 hr previously required.

A 4¾-in.-wide plastic tape with 16 control channels controls a 13½-x-28-in. Jones & Lamson positioning table, used with a manually-controlled 28-in. Cincinnati-Bickford spindle for sensitive drilling operations on small parts. This machine has conventional power-feed controls, plus electronic controls for automatic table positioning.

Like the Kaukauna machine, this unit can be controlled manually with pushbuttons, and has digital turrets for presetting desired table positions. These controls, as well as the punched-tape controls, provide automatic positioning of the work under the drill spindle anywhere within the 20-in. longitudinal ("X" axis) and 12-in. transverse ("Y" axis) power movement range of the table.

Hand Punching of Tapes

Control tapes for the J & L table are punched from a worksheet with a hand punch having 16 punch positions. Tape length depends on the number of hole locations to be programmed. Minimum length is 11 in., to permit forming a loop by joining the two ends. In this way, control unit can automatically reset the tape to the starting position upon reading a "reset" code punched after the last hole position has been programmed. Maximum tape length employed so far for this unit is almost 4 ft.

Work can be positioned on the table with simple locating blocks and clamps, machine vises, or simple, inexpensive fixtures. No longer is it necessary to make expensive drill jigs for many of the jobs requiring precision hole location, because hole location tolerances of 0.001 in. are easily held.

Savings in Floor-to-Floor Time

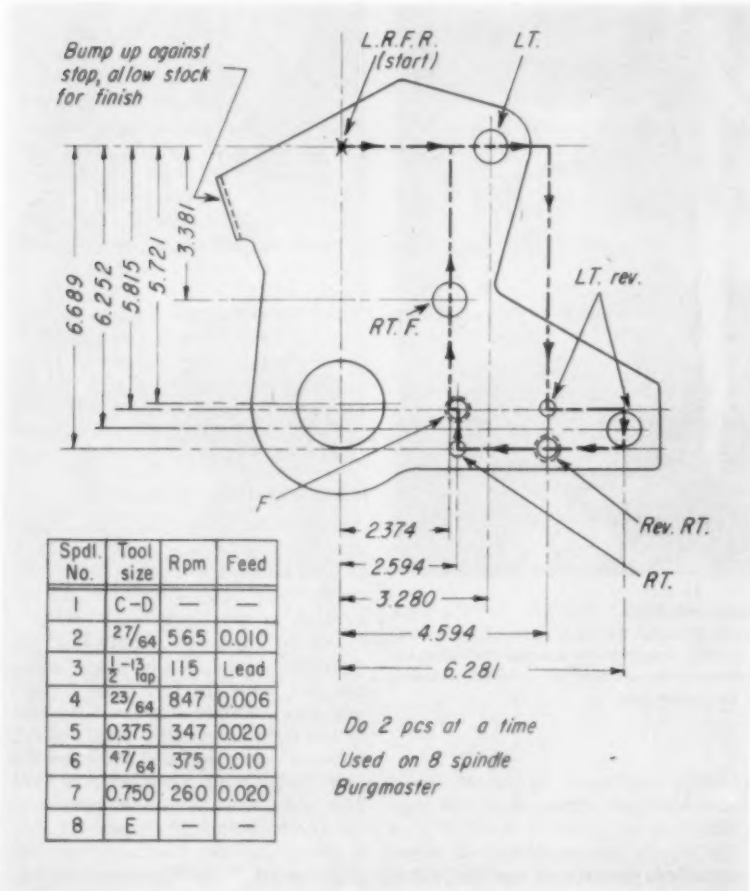
Generally, savings in floor-to-floor time of 30 to 40% are achieved over sensitive drill press setups, regardless of whether the parts previously were drilled to layout or in jigs.

Recently Goss transferred drilling and reaming of small malleable-iron transfer roll adjusting plates to the J & L machine from a conventional No. 2 sensitive drill press. Job-lots involve four pieces.

Under the old setup, one part was laid out in 0.8 hr, then the four 1.500-in.-thick parts were stacked and drilled and reamed as a unit in 2.3 hr—a total of 3.1 hr. for each lot. Three holes were drilled and reamed, another was only drilled.

For the tape-controlled machine, it was necessary to spend 1.3 hr programming and punching the tape.

Tape controls cut drilling cycles 30-50% . . .



Spdl. No.	Tool size	Rpm	Feed
1	C-D	—	—
2	27/64	565	0.010
3	1/2-13 tap	115	Lead
4	23/64	847	0.006
5	0.375	347	0.020
6	47/64	375	0.010
7	0.750	260	0.020
8	E	—	—

Operation drawing is prepared by tool designers . . .

All necessary table location dimensions and machine operating instructions are shown on this operation drawing prepared by tool designers at the Goss plant for each job assigned to the Burgmaster Micro-Positioning-table-equipment, turret-head drilling machine. Operating data (and hole processing sequence) are obtained from industrial engineers assigned to the departments involved. Seven of the eight spindles available on the No. 3-BH Burgmaster are used in the above arrangement—for drilling and tapping SAE 1020 steel roller sockets. Large hole (previously machined) locates workpiece

Machining time was 1.7 hr for each lot of four parts, using a simple locating and clamping setup to hold the stack of four parts.

Eliminating tape preparation time (because the tape will be used over and over again), time for each lot of four parts has been cut from 3.1 to 1.7 hr—a savings of 1.4 hr per lot, or a little more than 45%. And hole location is more accurate, because it is difficult to hold hole locations within less than 0.010 in. on layout jobs of this size.

Burgmaster turret drilling machines also have proved effective for cutting cost of drilling, reaming, tapping, etc, small parts—particularly when machines are equipped with Micro-Positioning tables for automatic relocation of work under spindles between turret cycles. Goss has had two such machines, a No. 2-BH and a No. 3-BH Burgmaster, in use for almost a year.

With these machines using tape but not numerical control, the operator cycles the machine manually for the first part—indenting longitudinal ("X" axis) and transverse ("Y" axis) spring-steel tapes with built-in center punches at each hole location. The indents so produced are approx 0.022 in. high. They actuate precision limit switches in the table movement control circuit as the table is repositioned automatically between machine turret cycles.

The only difficulty experienced with these units has been an occasional incorrect setting because one of the two positioning limit switches failed.

Generally, table positioning is easily held within 0.002 to 0.003 in. Tape templet control is not quite as close as are locations held consistently by electronically controlled systems employed in other tape-controlled machines at Goss, but close enough for many of Goss's drilling jobs, where hole location tolerances closer than 0.010 in. were difficult to hold without making jigs.

On a job calling for drilling, countersinking and pipe tapping two holes from both ends (and drilling two other small holes in 200 SAE C-1020 cold-rolled-steel lubrication blocks) Goss cut total machining time almost 29% by assigning the operation to a No. 2-BH Burgmaster with a six-spindle turret, instead of doing the job in a No. 2 sensitive drillpress with a jig.

The 200-lot job was done in 19.4 hr, compared with the 27.2 hr required when the same number of parts were machined conventionally. The drill jig, which originally cost more than $200, no longer is needed. Further savings will be realized when this job is repeated, because the 19.4 hr needed for the Burgmaster setup included tape preparation time. These tapes, now stored in the tool crib, will be reusable many times.

A similar comparision of eight jobs previously drilled in jigs or to layouts, and now assigned to the tape-controlled No. 3-BH Burgmaster with a No. 3A Micro-Positioning table, shows an average floor-to-floor time reduction of 49.5%. This machine has an eight-spindle turret with a 12 x 21 in. table.

Russians producing 800 alloys in electric furnaces

Electrometallurgy has developed so fast in the Soviet Union that the Russians today are turning out some 800 types of metals and alloys in electric furnaces, according to a Soviet dispatch. Special furnaces are now being installed in various plants to meet an anticipated huge increase in needs for cold-rolled steel for transformers. Such steel, the Russians claim, reduces to half the wastage of vitally needed electric energy. Needed steel purity will be achieved by pouring of alloys and metals under vacuum.

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SEPTEMBER 8, 1958

The production man's guide to

Fastening Devices

Knowing how to put a product together is one of the keys to efficient production. Quick, inexpensive machining and forming techniques are wasted if slow, cumbersome and inefficient assembly methods are used. This Special Report summarizing typical mechanical fastening devices will help you select a fastener that will lead to a more dependable, more economical product.

By John J Dwyer, Jr assistant editor

An assembly is only as strong as the fasteners that hold it together. Consider your automobile. It has over 100 critical fasteners, and failure of one or more could be serious. Only recently, New Jersey motor vehicle officials issued a report that traced more than 1200 auto crashes in that state alone to loosened fasteners.

Of course, not every case of fastener failure is this serious. But somewhere, at some time, we've all come up against a fastener problem. Remember that loose doorknob? Or the time that little screw fell out of your eyeglasses? Temporary annoyances, to be sure, but they illustrate our point. No matter how large or small, no product will function properly unless it is put together properly.

Out of the thousands of mechanical fasteners available, how do you choose the one best suited for your job? Function, cost, availability all enter into the problem. Standardization has simplified the problem somewhat, but many times a special, non-standardized fastener is more suitable. Here's where a broad knowledge of the available fastening devices can save you time, money and innumerable headaches.

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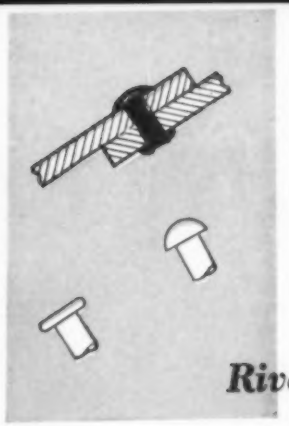


Rivets...

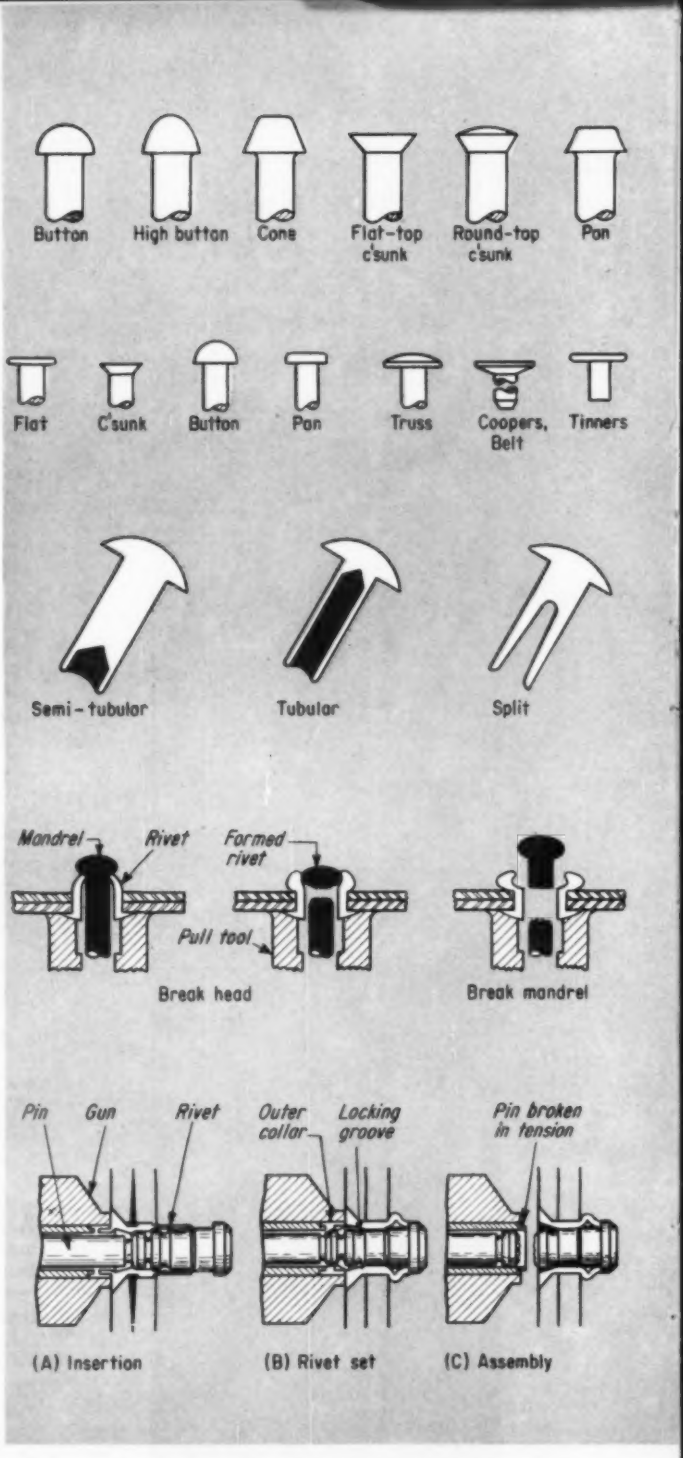
Large solid rivets . . .

Small solid rivets . . .

Semi-tubular, tubular, split rivets . . .

Pop rivets . . .
consist of two parts, a hollow rivet and a mandrel. Special tool pulls the mandrel into the rivet material. After upsetting the rivet and clinching, the mandrel breaks at the head or at the necked stem. Both types are illustrated

Huck rivets . . .
consist of a sleeve and a pin. As the pin is pulled through the sleeve it upsets the rivet shank. Driver breaks off outer collar from sleeve and forces it into locking groove. Pin breaks in tension



Standard rivets are permanent fasteners that depend on deformation of part of their structure to provide holding power. Fastening with rivets is popular because of its simplicity, dependability and low cost. Some of the more obvious advantages include high production rates; low equipment costs; the ability to join a wide variety of similar or dissimilar metals; strength, because of uniform grain structure; wide choice of rivet materials; and no need for skilled labor.

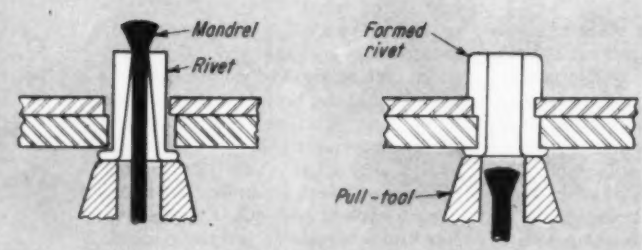
Standard rivets

For purposes of classification, they can be grouped as: large solid rivets; small solid rivets; semi-tubular, tubular and split rivets; and specials.

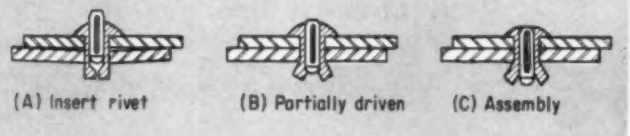
Large solid rivets (½ in. dia or larger) are used in construction of buildings, bridges, ships, boilers and other heavy construction work. Standard sizes for these rivets range from a nominal body diameter of ½ in. through 1¾ in.

Small solid rivets (7/16 in. dia or smaller) are used in assembling equipment where shear or tensile loading may be high and a permanent, lightweight fastener is needed. They are commonly used in aircraft, vehicle bodies, ships and many types of industrial equipment.

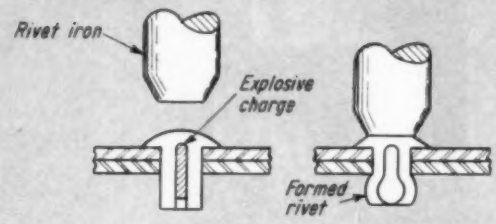
Semi-tubular, tubular or split (bifurcated) rivets can be used in a wide range of materials and an endless range of applications. In addition to low cost and speed of application, small tubular and semi-tubular rivets can be used to advantage



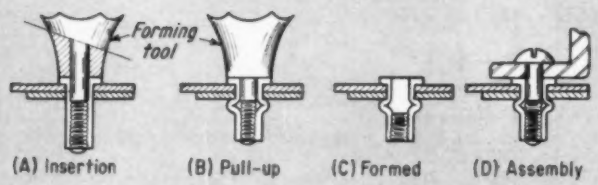
Chobert rivets . . .
are upset by drawing a mandrel through the tapered hole. These rivets will adjust for slight misalignment of hole while providing tight clinch. Pull-through type (illustrated) and self-plugging type available



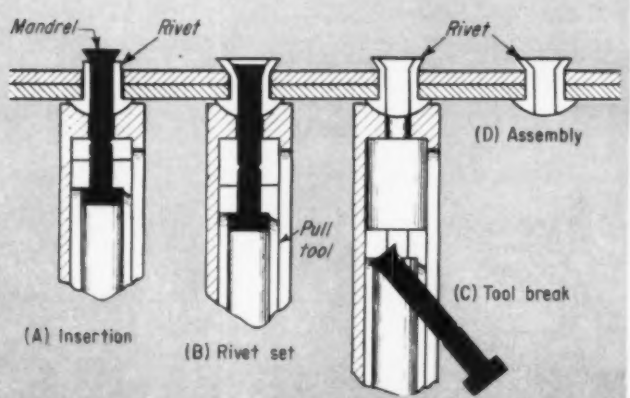
Drive rivets . . .
have a drilled hole into which a grooved steel pin is placed. Pin is driven with hammer until it is flush with the head, spreading the four sections of shank outward, forming clinch



Explosive rivets . . .
resemble ordinary solid rivets, but have a small explosive charge in the shank. Charge is detonated by heat from an electric gun, expanding charged end of shank and forming a blind head



Rivnuts . . .
have a threaded core which accepts a special pull-up tool. Tool upsets the rivet shank making a tight metal-to-metal fit. Pull-up stud is then disengaged



Cherry rivets . . .
are installed by placing the shank in the hole and pulling the stem with a special tool to form the blind head. These rivets are available in pull-through and self-plugging types

in joining assemblies of non-uniform thickness, made of dissimilar or non-metallic materials or a variety of metals in lightly loaded structures.

Semi-tubular (sometimes called "shallow-drilled") rivets are the most widely used of all types. They can be extruded or drilled, and are used in any assembly operation where holes have been drilled or punched prior to rivet setting. Suitable for assembling plastic, wood, sheet metal and aluminum, these fasteners provide full shear strength and strong clinch or set.

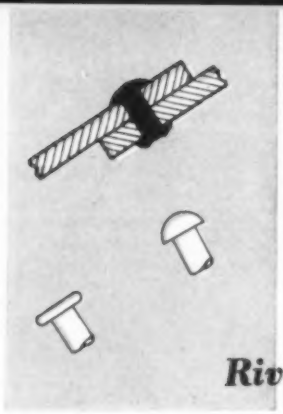
Tubular rivets are deep drilled and are suited for use with soft materials such as plastics, canvas, leather, wood, or wherever the rivet will pierce its own hole when set.

Split (bifurcated) rivets come in the punched and sawed types. The sawing process produces a stronger rivet that is suited for piercing fiber, wood or light-gage sheet metal. The punched rivet is suited for cardboard, canvas and lighter piercing operations.

Other rivets include the compression (cutlery) rivet, shoulder, decorative head and clinch head types. Many others are available or can be made to order.

Blind rivets

There are many cases where both sides of an assembly are not accessible. Here many of the standard fasteners could not be used. The solution lies in the use of blind fasteners. Most of them are rivets; some a cross between a rivet and a bolt.



Rivets...

Eyelets
Eyelets can be used in place of rivets where shearing stresses and pressure-tightness are not important considerations. They are considerably cheaper than most other types of fasteners; hopper-fed machines can cut the cost of application.

There are hundreds of sizes, ranging from eyelets with an inside diameter of 0.037 in. to grommets of 1.00 in. or more. The holding power of an eyelet is to a large extent determined by the roll. On hard goods, the amount of material rolled over should not be less than 1/16 in.; more than ⅛ in. is superfluous. On most hard-goods assemblies a brass eyelet will do the best job, though aluminum, steel, stainless steel and copper eyelets are used. Copper eyelets find wide use in printed circuits.

Drive-Pin rivets . . .
are two-part factory pre-assembled rivets. Pin is driven through the tapered hole at end of sleeve, causing sleeve to expand and lock. Lip section is peened over to lock pin

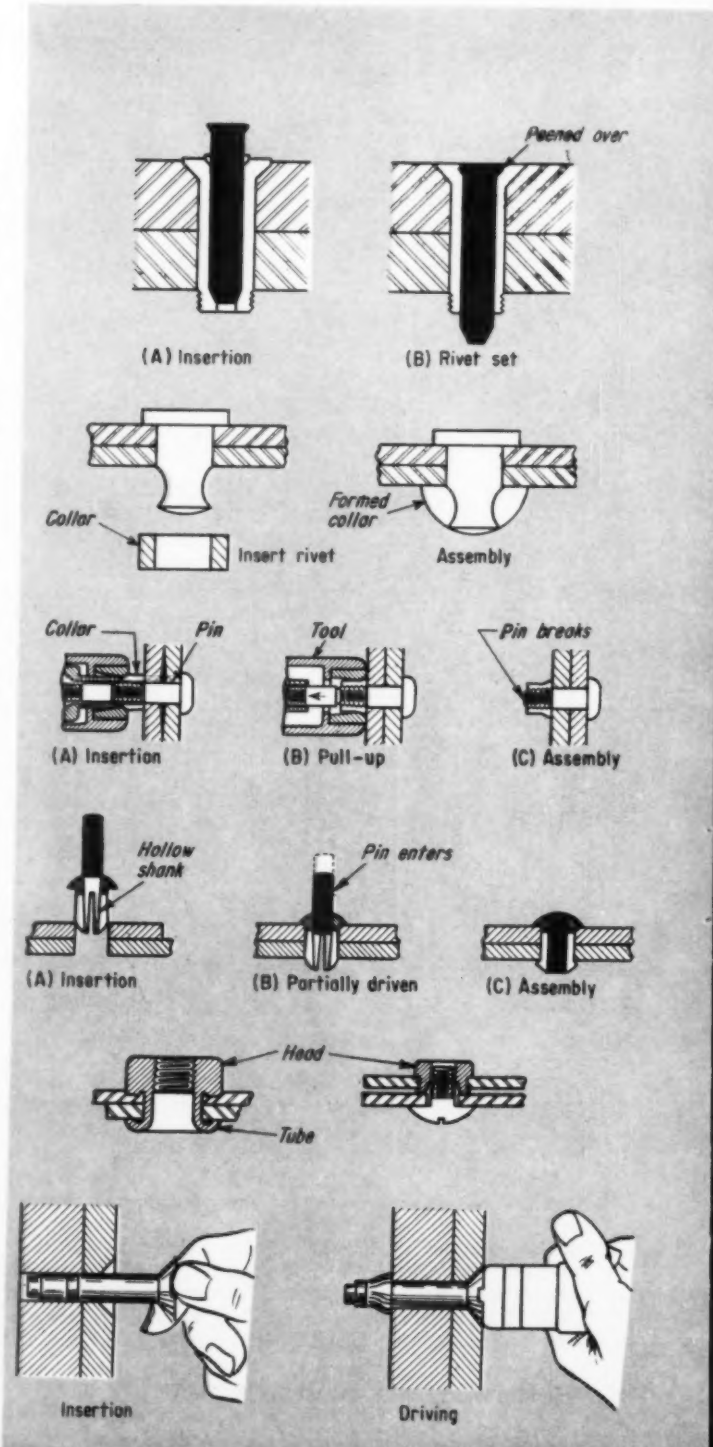
Hi-Shear rivets . . .
consist of a headed pin and a collar. Pin is made of an alloy too hard to upset whereas collar is made of a malleable metal that can be upset. A special set is used to force collar into pin groove. Both sides of assembly must be accessible

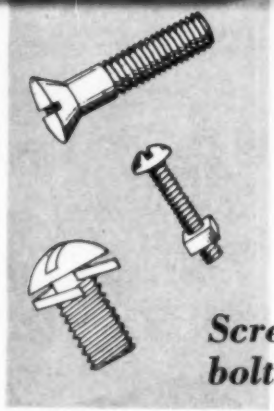
Huckbolts . . .
are two-piece fasteners which combine the features of a bolt and a rivet. They consist of a headed pin and a collar that can be swaged over the locking grooves of the pin. Both sides of the assembly must be accessible

Plasti-Rivets . . .
are one-piece, self-expanding, blind plastic rivets for fastening anything from paperboard to metal. They are available in a wide variety of thermoplastic materials

Threaded rivets . . .
are available in a variety of styles with oval, flat or countersunk heads. Types illustrated serve as nuts and have a clinching tubular section and internal tapping

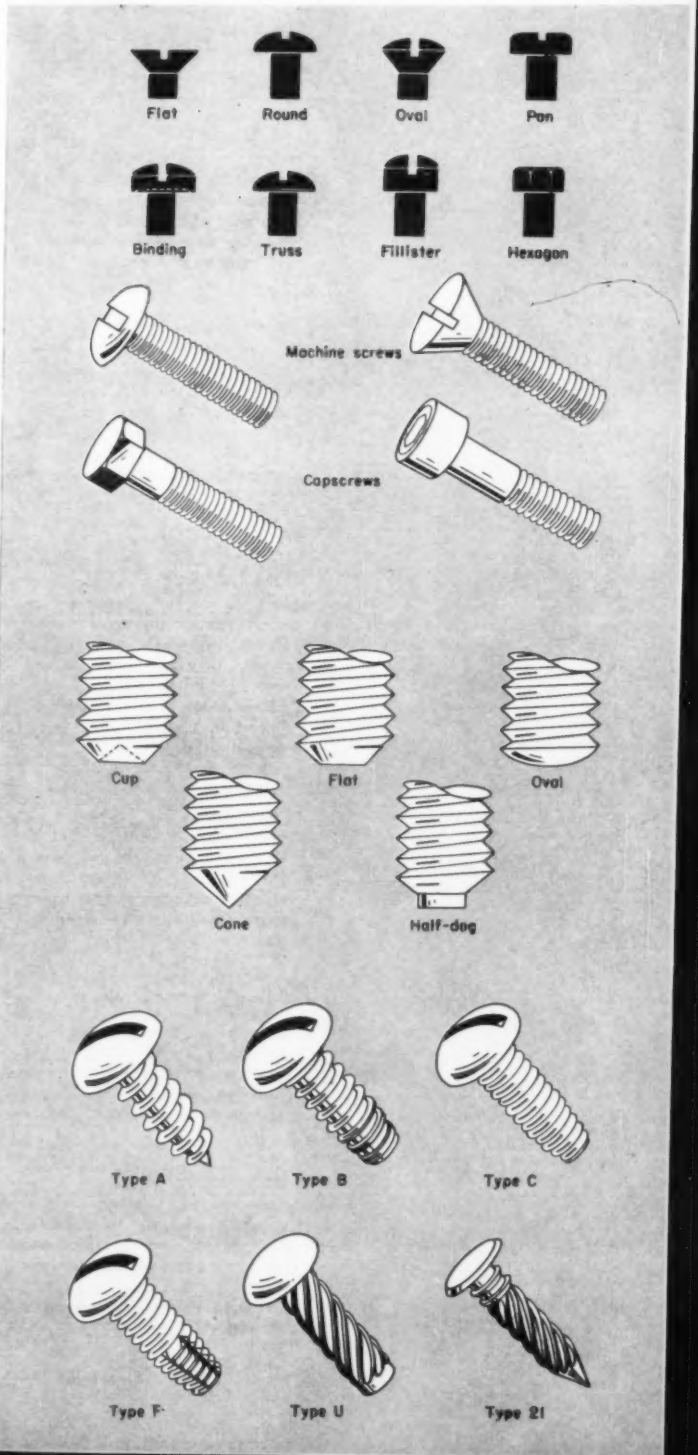
Sleev-Lock . . .
is a removable and re-usable blind fastener which can be inserted, tightened up and later removed from one side of a panel or sheet metal assembly with a simple power tool attachment. Attachment holds outer sleeve stationary while driving core bolt





Because joints assembled with screws, bolts and studs can readily be disassembled and reassembled, these fasteners find wider use than any other type of mechanical fastener. The standard screw fasteners have been standardized in such a way that the selection of the proper fastener is resolved into checking a designated standard for the critical dimension

Screws, bolts, studs...



Standard screw heads . . .

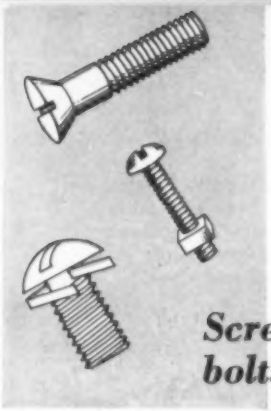
Machine screws . . .
Machine screws are available in round, flat, fillister, oval, truss, binding, pan, hexagon, drilled fillister and 100° flat head styles. Heads may be slotted or recessed (either Phillips or Frearson); clutch head types also available. Points are not finished. They are used for general fastening in tapped holes or with nuts in such items as electrical equipment, automotive equipment, etc

Capscrews . . .
Slotted head capscrews are available in round, flat and fillister head styles. Capscrews are also available with hexagonal-socket and fluted-socket heads. Other head styles include hexagon (plain, slotted or recessed), flat fillister (slotted or recessed), knurled (plain or recessed). Capscrews have finer tolerances and finish than machine screws. They are used for general fastening in tapped holes or with nuts in such production items as machine tools, automotive equipment, farm machinery, aeronautical equipment

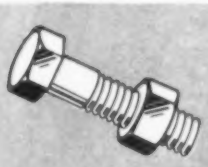
Setscrews . . .
Setscrews are available in square head and the slotted or socket-type headless styles. Points available include flat, cone, oval, cup, dog and half-dog. The cup point is the most widely used. It is employed where fast and more-or-less permanent location of collars, pulleys, etc. on soft shafts is required

Self-tapping screws . . .
The Type A thread-forming screw is used to join metals 0.015 to 0.050 in. thick. Type B is used for the same jobs as Type A but can join metals up to 0.200 in. thick. It can also be used in plastics. Hex-head Type B screws can be used in metal as thick as 0.500 in. Type C is a thread-forming screw with a machine screw thread. Type F is one of a variety of thread-cutting screws with machine screw threads. It is used for metal 0.050 to 0.500 in. thick, plastics, and for fastening to castings and forgings. Spaced thread types are avaliable

Drive screws . . .
Type U is a thread-forming screw that is hammered or pressed into a prepared hole. It is used in metals 0.050 to 0.500 in. thick, and for fastening to castings, forgings and plastics. Round head is standard. Type 21 is used for fastening fabric, fiber and leather to sheet metal. It is widely used in the automotive industry; slim pan head is standard



Screws, bolts, studs...

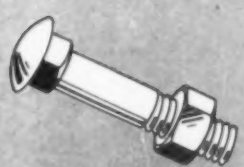


Machine bolt

Machine bolts . . .
Machine bolts are available with square, hex, rounded, or flat countersunk heads. They make snug, full-bodied fits in both tapped and drilled holes, and are supplied with hex or square nuts. They are used for general fastening in tapped holes or with nuts in such items as automobiles, aircraft and farm machinery

Stove bolt

Stove bolts . . .
Under present standards, stove bolts are regular machine screws, supplied with nuts (usually square). They are used for general fastening in such production items as electrical equipment, household goods



Carriage bolt

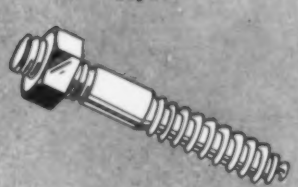
Carriage bolts . . .
Carriage bolts are generally used for fastening castings and forgings because neck design offers greater tolerance of fit. Heads are usually of flat, countersunk or truss type. Neck design, including square, oval, ribbed or finned styles, prevents bolt from turning. They come with or without nuts

Plow bolt

Plow bolts . . .
Plow bolts are widely used in farm machinery, also in heavy roadbuilding machinery and railroad equipment. Flat countersunk heads provide flush fitting surface

Lag bolt

Lag bolts . . .
Also called lag screws, lag bolts are used mainly in wooden construction, and are normally furnished with square heads and gimlet point



Hanger bolt

Hanger bolts . . .
One end of a hanger bolt is gimlet pointed and threaded for turning into wood. Other end is coarse threaded to receive a nut. They are used to support or hang equipment against a wooden surface

Tap-end studs . . .
Stud can be removed from tapped hole only by force because tap end is threaded (Class 5) for interference fit. Other end is threaded (Class 2A) for nut. Stud is used in place of bolts or capscrews in general applications such as cylinder heads, brackets, fixtures

Tap-end stud

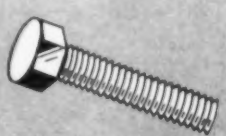
Double-end studs . . .
This stud is used in place of bolts (or as a tie rod) with nut on each end. Each end is threaded for Class 2A fit

Double-end stud

Continuous-thread studs . . .
Threads are Class 2A full length. This fastener is used in place of double-ended stud where maximum adjustment is needed

Continuous-thread stud

Tap bolts . . .
A tap bolt is a regular hex-head bolt with pointed end and fully threaded shank. It is used in tapped holes wherever a through bolt, capscrew or stud would be impractical

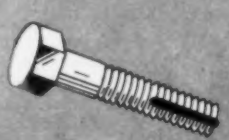


Tap bolt

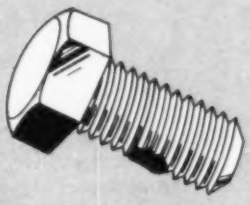
Lok-Thred screw . . .
has a special thread which is a modification of the American National thread form. It has a similar 60° thread flank angle, but has a larger root diameter, and a wider root surface that is tapered 6° longitudinally to the axis of the thread. The interference on the 6° root forces metal to flow upward on the thread flank, resulting in a self-locking application

Lok-thred

Long-Lok screws . . .
contain longitudinally inserted locking element. To be effective, the screw should engage the mating thread for a depth equal to the thread diameter. The insert takes up axial clearance and causes metal-to-metal drag. This action also takes up the radial clearance. Insert material can be matched to temperature conditions

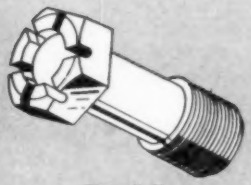


Long-Lok



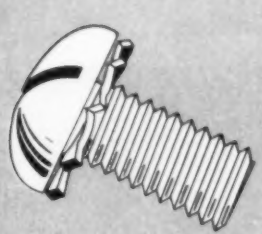
Nylok

Nylok self-locking screws . . .
have a resilient, projecting nylon pellet inserted permanently in the body. The pellet compresses when the threads are engaged, and the resultant spring-like thrust wedges mating threads together. The pellet also seals against liquids



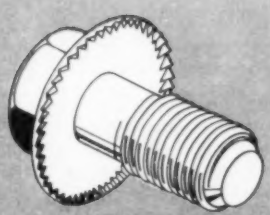
Place Bolt

Place Bolts . . .
resist vibration because of a spring-like action. The flexible diaphragm-like zone formed between the slotted segments and the circular recess under the head acts as a controlled spring element, when the head is properly wrenched. This action increases the bolt's over-all elastic elongation, thus reducing fatigue failures



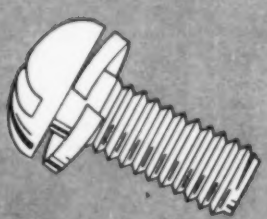
Sems

Sems . . .
are pre-assembled fasteners consisting of a screw and a lockwasher. Rolled threads hold the lockwasher closely under the screw head; washer can rotate, but cannot fall off. Wide variety of head styles and washer styles are available



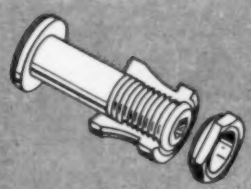
Spin Lock

Spin-Lock screws . . .
are one-piece fasteners with locking teeth under the head. The ratchet-like teeth lock into the mating surface and grip firmly, even under severe vibration. It takes about 20% more torque to loosen these screws than to tighten them



Springtite

Springtites . . .
are pre-assembled rolled thread screws with split-spring lockwashers. A variety of head styles and washer styles are available



Hi-Lok

Hi-Lok fastener . . .
combines features of a rivet and a bolt. The upper portion of the collar shears off at the design preload. Available in titanium, 4130 alloy steel, stainless and aluminum, this fastener is used in aircraft and missile assembly

Spin-Seal . . .
fastener consists of a spring-type hardened washer with a permanent flowed-in gasket that is pre-assembled to any type of standard machine screw, capscrew or bolt. It will seal on irregular, corrugated, curved or flat surfaces. Many other sealing screws are available; most use mastic sealing compound or a rubber or neoprene washer under the head

Dardelet Rivet-Bolt . . .
uses special tapered threads on both the bolt and nut. When initially engaged, tapered surfaces are not in contact and nut turns freely. When nut meets work, sloping thread surfaces are forced together and assembly is locked

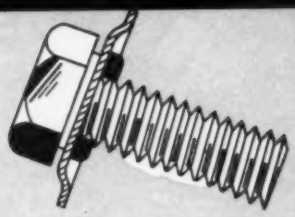
Hi-Psi bolt . . .
an external wrenching bolt for extreme loading conditions, has a minimum tensile strength of 220,000 psi. It has a modified thread form, called Hi R, in which the radius at the root of the thread is increased to reduce stress concentration

Countr-Bor screw . . .
is an externally wrenched fastener for use in standard counterbored holes. Large wrenching surface provides quick tightening with a standard wrench

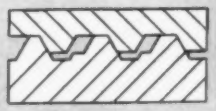
Weld screws . . .
designed for projection welding offer a simple means of attaching threaded fasteners to sheet metal. Welds are localized at predetermined locations by the projection lugs. Several styles are available

Hi-Torque . . .
bolt features a special, generated recess in its countersunk head that positively grips the driver blade. The recess can withstand high torque, and because it is very shallow it can be used in thin heads

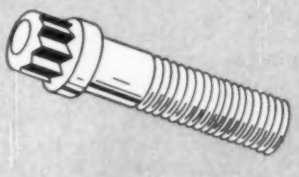
Wing and thumb screws...
are widely used wherever a finger-tight screw is needed for frequent adjustment or for knock-down assembly applications. They are made in several ways: pressing, forming, machining, welding and die casting. Several head styles are available



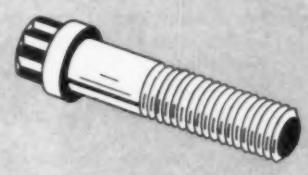
Spin Seal



Dardelet (unlocked)

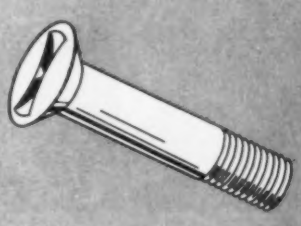


Hi Psi

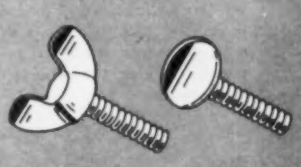


Countr-Bor

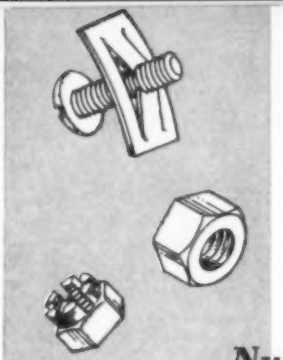
Weld screws



Hi-Torque



Wing and thumb screws



Nuts...

Standard nuts

The purpose of a nut is to load a bolt in tension for a tight joint. For this, it is given a shear strength greater than the breaking point of the bolt, and sufficient bearing area to avoid crushing the bearing surface.

The two series most commonly used are the "finished" and the "heavy" series (ASA B18.2—1955). The former is designed for general usage; the latter is heavier and thicker and is needed only when bolt holes have large clearances, or for high bolt loads. In addition to these series, a regular square nut and a machine screw series are also standardized.

Jam nuts are thinner than the finished or heavy nuts and are generally used in connection with finished or heavy nuts to lock them in place. When used this way, the jam nut should be the bottom nut (adjacent to the work) and a full thickness nut should be on top and wrenched fully. Jam nuts can be used by themselves on bolts subjected to shear rather than tensile loading.

Other nuts available include the wing nut, knurled nut, and many miniature nuts made of plastic, sintered brass, or die cast in zinc.

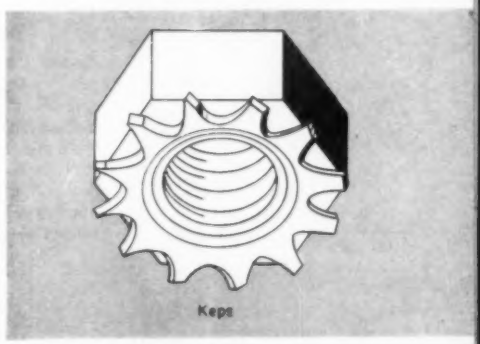
Locknuts

How do you prevent a nut from working loose under vibration? There are many ways. Among the oldest methods are pinning through the nut and bolt with pins, using a jam nut under the regular nut, using a lockwasher, staking or punching the thread of the nut, using a drop of cement or lacquer between the threads, using special threads in the nut or bolt.

In more recent years many special locking fasteners have been developed to solve this problem. Since the locking action is more easily built into the nut, the majority of these special fasteners are nuts, and the opposite component is usually a standard bolt or screw. On the whole, no special tools are needed. They can be handled with standard wrenches; most of them can be started by hand until the locking section is reached, when a wrench becomes necessary.

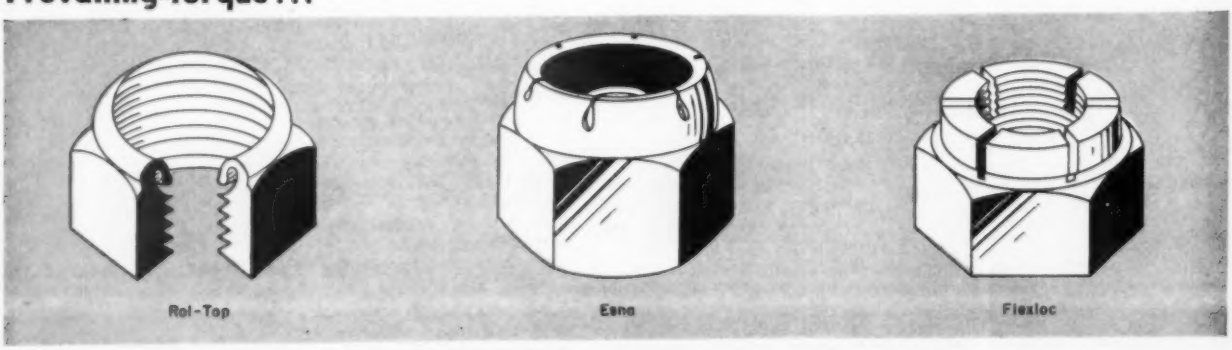
The nuts described here are divided into free-spinning, prevailing-torque, and spring-action locknuts, depending on the locking principle. Several non-locking nuts are also described.

Free-spinning...



Keps pre-assembled nut...
and lockwasher unit is widely used in mass assembly industries. The specially designed free-turning lock washer "funnels" bolt onto the nut for easier starting. A variety of styles are available

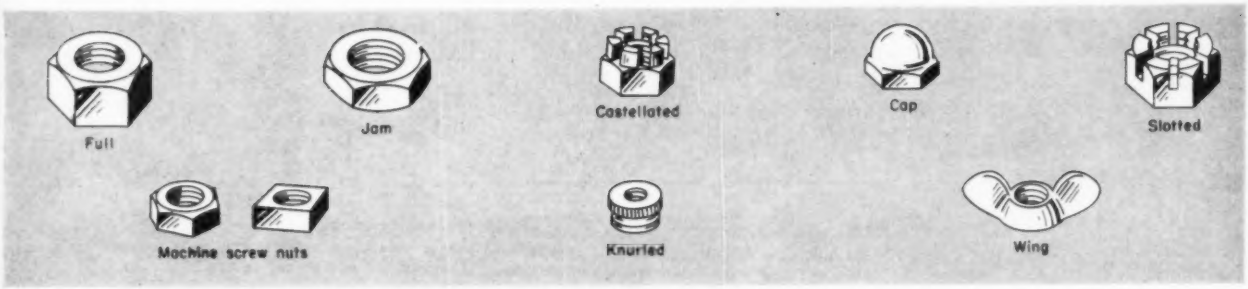
Prevailing-torque...

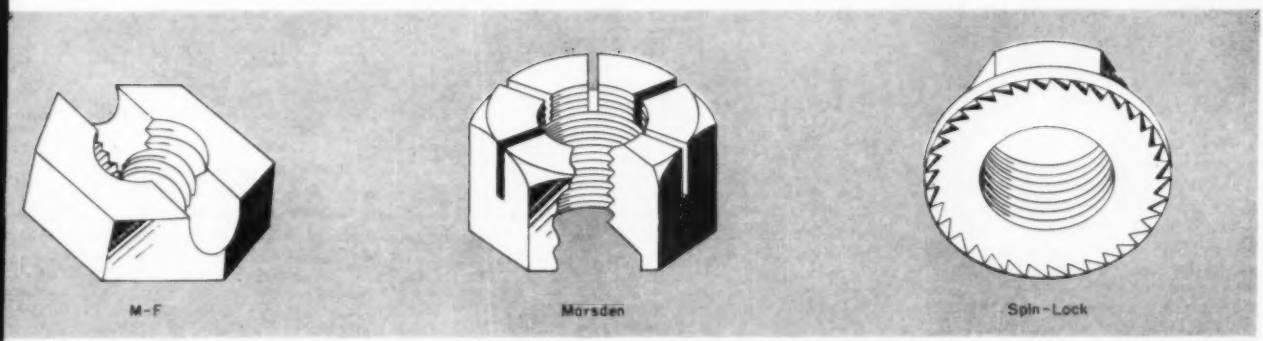


Boots Rol-Top locknut...
locks because of the slight downward offset given the upper threaded locking section. The spring tension of the locking section exerts downward axial tension, thereby locking the threads of the bolt in any position

Elastic Stop Nut...
has a resilient locking insert in the head. The ID of the insert is smaller than the major diameter of the bolt. When threads of the bolt enter this section a mating thread is impressed into the locking collar. The compressive forces provide a friction grip

Flexloc locknut...
has a slotted top which provides firm radial locking. The nut spins on freely until the threads of the locking collar are engaged; then nut is wrenched. Inward pressure of locking collar causes nut to lift upward, bringing the remaining nut threads to bear on the bolt threads

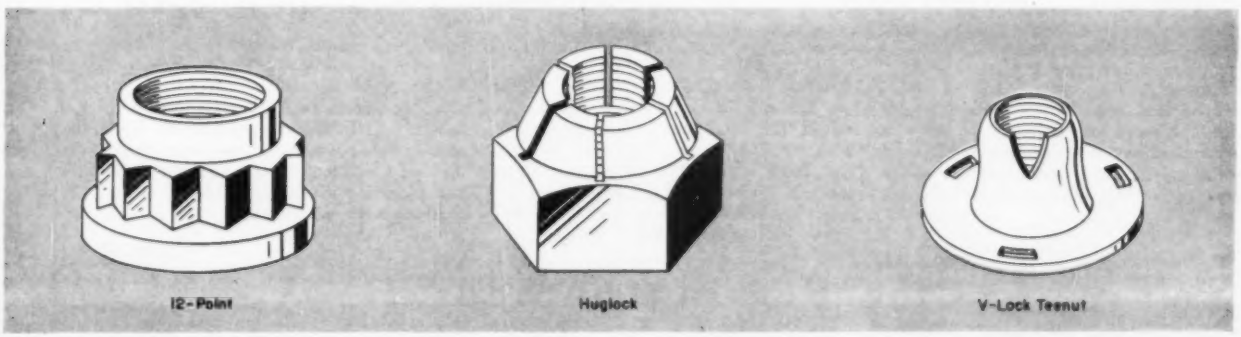




M-F Speed Holding Nut . . .
is used alone and locks when wrenched in place. When the lower arched surface of the nut contacts the face of the work, it flattens out, causing the top section, or groove, to pinch in and bind on the bolt. Square nut also available

Marsden locknut . . .
has several narrow slots dividing the upper part of the nut into several threaded segments. Bottom face is recessed so that only a narrow ring acts as a seating surface. When nut is wrenched, pressure on seating rim forces upper threaded segments radially inward

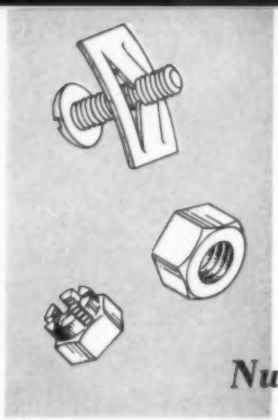
Spin-Lock nut . . .
has ratchet-like teeth formed in the outer portion of the enlarged nut base. When nut is fully tightened, these teeth dig into the mating surface. Rim of nut base flexes slightly assuring constant tooth pressure



Self-locking 12-point nut . . .
is designed for critical airframe fastening applications. Solid locking collar is squeezed inward in three places to provide vibration-proof locking action when a bolt is threaded into the nut

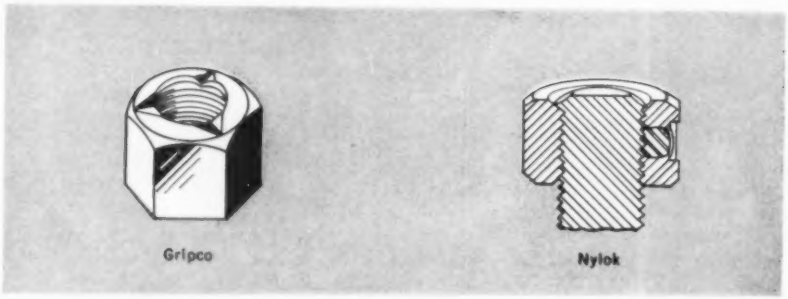
Huglock . . .
is used to resist severe shock and vibration. The tapered top portion of the nut is slotted to form six threaded segments. These curve inward to press against bolt. Nut can be used both as a stop nut or a locknut

V-Lock Teenut . . .
is a re-usable, all-metal, self-locking nut. Upper portion has a vee notch and is squeezed inward to form a permanent set. When bolt reaches notch a wedging action takes place



Nuts...

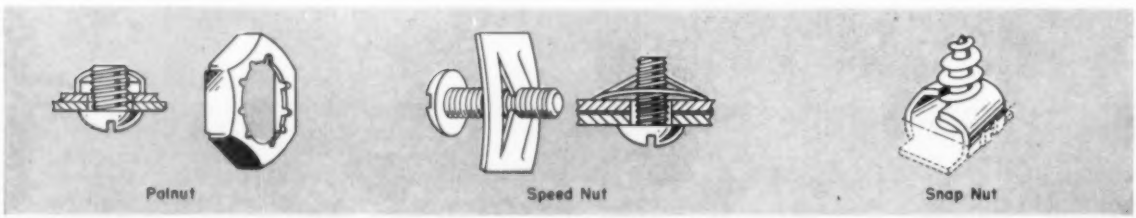
Prevailing-torque...



Gripco locknut . . .
is a one-piece fastener that withstands vibration and loosening torque. Triangular depressions on the top surface deflect the thread to provide positive holding action in any position on the bolt

Nylok locknut . . .
provides locking action through a nylon plug inserted and staked in one of the nut sides. The resilient plug wedges the threads of the bolt against the opposite nut threads

Spring-action...

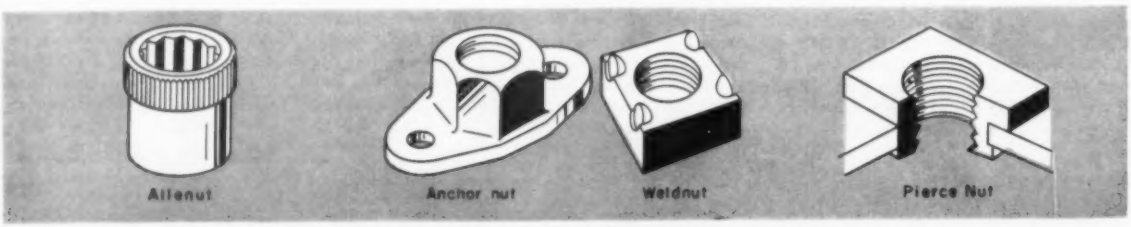


Palnut locknuts . . .
are stamped from spring steel. They develop a locking action that resists loosening effects of vibration. Spring forces are exerted upward on the bolt threads and downward on the part, as well as inward to grip the bolt. Many styles are available

Flat-type Speed Nut . . .
is stamped from spring stock. The prongs move inward and lock against root of thread; arched base produces an upward thrust against threads. Wide range of styles and sizes available

Snap Nut . . .
is one of a variety of blind screw fasteners used in sheet metal. It is snapped in place from one side; subsequent expansion of the thread-engaging members spreads the fastener out so that it wedges tightly in the hole

Non-locking nuts...



Allenut . . .
can be used as an internal wrenching nut and a threaded insert. It is wrenched with a standard hex key. An external knurled collar provides insert anchoring. It can be cast or molded into pre-assembled parts

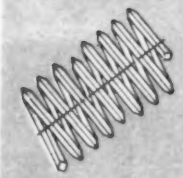
Anchor nuts and weldnuts . . .
are available in many styles and are designed for permanent attachment to the work. Anchor nuts (left) come in rigid and floating designs; the nut can be a locknut. Weldnuts (right) are designed for projection welding. Some must be piloted to the hole; others are self-piloting

Pierce Nuts . . .
pierce their own holes in sheet metal and become rigidly affixed to the panel. The nuts are made of work-hardened steel. Driving equipment consists of a punch to drive nut, a housing to guide and size it, and a die button for piercing and staking

Other locking methods...

There are many other ways of locking threaded fasteners besides the use of locknuts or special threads. Cotter pins, safety wire, setscrews and bent tabs have been used for years. Assembly is more costly than for other types of locking. Also, vibration may cause fatigue failure of the pin, tab or wire. On the other hand, these methods are most satisfactory where some relative motion exists between the respective parts of the joint.

Liquid thread sealant
Loctite sealant is a liquid plastic that hardens between metal surfaces to form a tough plastic that grips. Ordinary nuts, bolts, and screws treated with this material are reported to be so securely gripped that no amount of vibration will loosen them, yet they can be removed with ordinary tools. Loctite also seals threaded joints against fluid pressure, corrosion and rust.



Inserts...

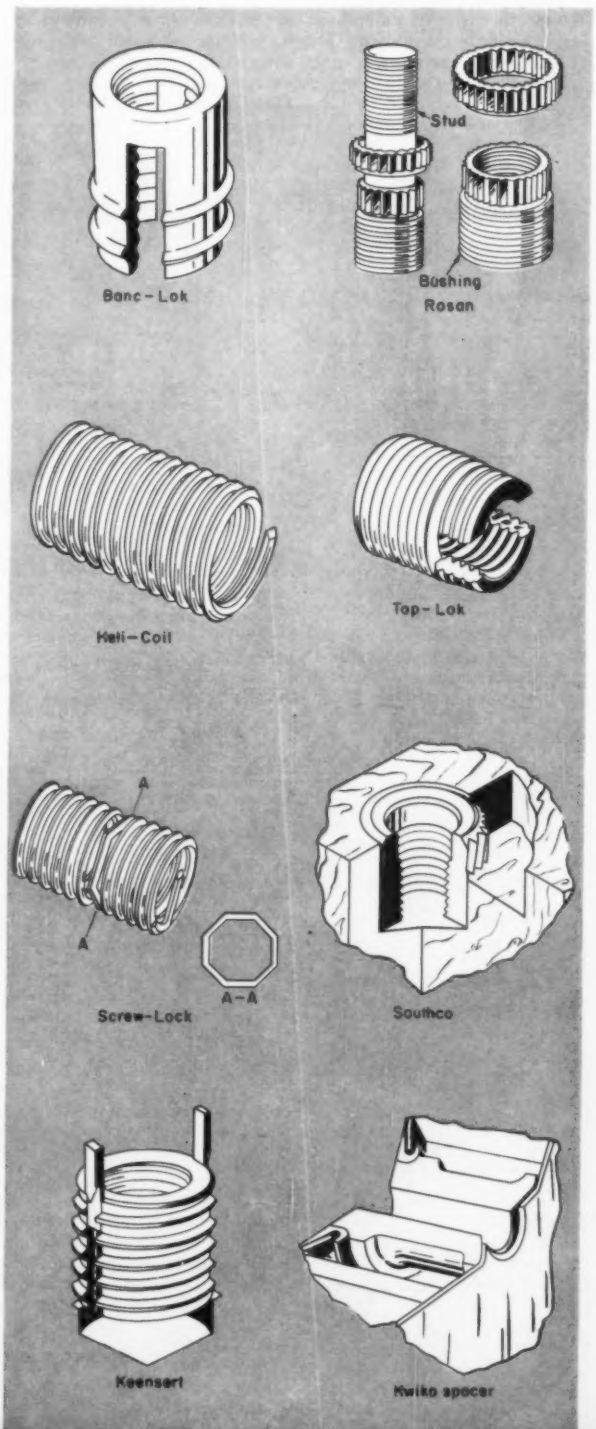
Inserts increase the load carrying capacity of the softer metals, plastics, and wood. They may be threaded into a tapped or drilled hole, driven into a hole, screwed into a threaded hole or molded into a part, depending upon the type and the application. Most of the inserts are self-locking. The threads on inserts are standard screw threads and are manufactured to most classes of fits

Banc-Lok insert . . .
is designed for materials too thin to tap or too soft for threads. When an insert is pressed into a hole, the slot closes, causing the tapped hole to become tapered. As a screw enters, the body of the insert expands, locking into the walls of the hole and exerting a locking action on the screw. Insert is used in wood, plastics and soft metal to provide threads in blind holes. Standard material is aluminum alloy

Heli-Coil . . .
screw thread fasteners provide permanent threads in tapped holes in any material. The insert is a coil of diamond-shaped wire which, when seated, provides standard 60° threads that resist wear and can withstand heavy loads. Standard material is 18:8 stainless steel

Screw-Lock . . .
inserts offer all the advantages of the Heli-Coil screw thread inserts plus a locking feature. One or more of the coils near the center of the insert approximate a polygon in shape, and the chords of these grip coils maintain a strong, spring-like pressure on the screw. Standard material is 18:8 stainless

Keensert . . .
is a one-piece, all-metal self-locking threaded insert. It provides strong threads in materials such as aluminum and magnesium alloys and plastics. Fully threaded externally, it is locked in place by two keys (supplied pre-attached) which are driven home after insert has been screwed in place

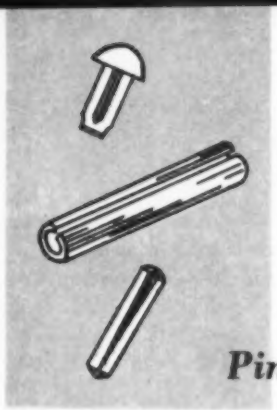


Rosan insert . . .
is a two-piece, all-metal insert consisting of an internally and externally threaded insert and a lock ring. This lock ring is serrated inside and out. The inner teeth mate with the serrated collar on the insert, the outer teeth bite into the metal when driven into place. The Rosan stud employs the same locking principle. Several variations are available

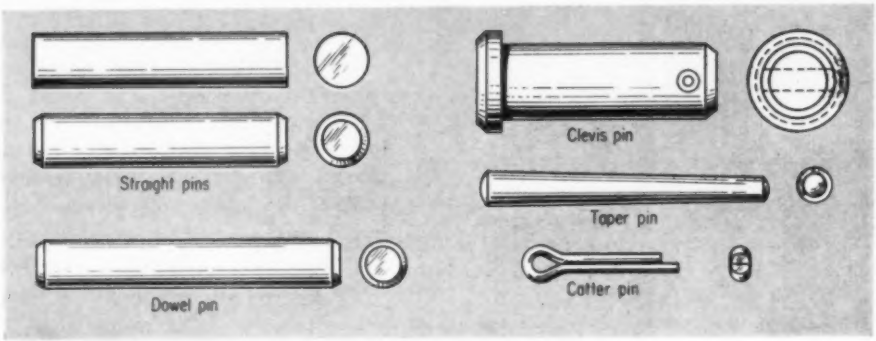
Tap-Lock . . .
self-tapping inserts provide strong threaded connections in metals and plastics. They are designed for materials which are machinable but of insufficient shearing strength to sustain applied loads in threads tapped directly in these materials. Several styles are available, including a Nylok series

Southco . . .
knurled and threaded inserts can be driven or pressed into materials ranging in density from wood to the softer metals. The deep spiral knurling takes a firm grip in a drilled or molded hole, resisting both torque and pull-out

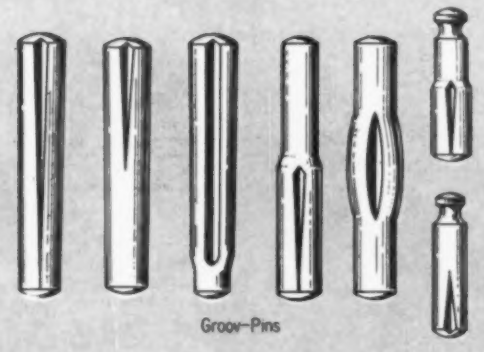
Kwiko spacer . . .
for honeycomb is but one of a series of special spacers for honeycomb fastening applications. Spacer is placed in a suitable hole; then the grommet is applied and presses into the sandwich. The contour of the spacer shank causes the grommet to flare out and grip the sheet



Pins...



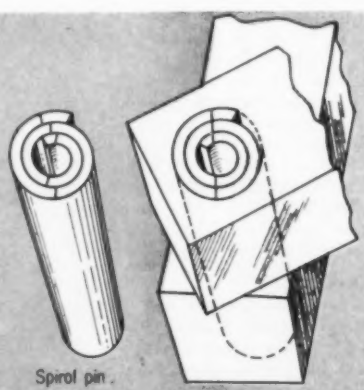
Standard pins...
Pins are fastening devices that are generally held in position by interference fits. They are used to attach gears, hinges, pivoting parts and other similar assemblies, and in many cases may replace keys, splines, nuts and bolts, and rivets. Standard pins include the straight pin, dowel pin, taper pin, clevis pin and several styles of cotter pins. There are several special pins. Those described here can be re-used many times and are highly resistant to vibration



Groov-Pins...
are cylindrical pins that have longitudinal grooves rolled or pressed into the surface. When a pin is forced into the proper size hole the constraining action of the hole wall causes the displaced material to flow back, and within its elastic range effect a locking fit. These pins are also available under the name Drive-Lok pins

Grooved drive studs...
can be used wherever a headed fastener is required to replace rivets, screws, etc. The standard type can be used to secure cover or name plates or conduit clamps to cast iron or steel. The offset ribbed type is designed for use in any material subject to plastic deformation

Rollpins...
are slotted, chamfered cylindrical spring pins. The slot permits compression of the cylinder as the pin is driven, and the resulting tension, caused by the constraining action of the hole wall, secures it in position. This type of fastener is also available under the name Sel-Lok spring pin



Spirol pins...
are formed by rolling strip steel or other thin flexible material into a coil. When inserted in a hole slightly smaller than the diameter of the pin, they compress to hold themselves in place. Physical properties may be changed by varying the thickness of the strip and the tightness and number of coils

Washers, Retaining rings...

Retaining rings provide for... quick and easy assembly and disassembly of components. They can be snapped into any properly designed circumferential groove to form an artificial shoulder. Consequently, in many applications they can replace nuts, machined shoulders, collars, cotter pins or other positioning or retaining devices.

There are two basic types: one, a bent-wire ring of uniform cross-section; the other, a tapered or concentric circular ring stamped from strip stock. The bent-wire rings are more economical to make but they may take a permanent set. Stamped rings have a tapered radial width and have punched lugs for ease of application. They remain circular under deformation as long as working stresses do not exceed the yield strength of the material.

Standard material is carbon spring steel. Other materials available include stainless, phosphor bronze, beryllium copper and aluminum. A vinyl plastic shaft-retaining ring is also available.

Internal

Washers are used under the heads of screws and bolts and under nuts to better distribute the compressive stress. They also prevent marring of fine finishes. Washers are also used between rotating parts to reduce wear and to distribute thrust loads. Another use is to prevent the loosening of threaded assemblies; this calls for a specially designed washer, the lockwasher.

Plain washers are available in most of the metals used for bolted assemblies. They are standardized for screw sizes from No. 0 through 3 in. and come in four series known as light, medium, heavy and extra heavy.

Split-spring lockwashers are used when occasional disassembly and reassembly are required. They are available in a wide variety of styles and materials and come in the same four series as plain washers.

Tooth-type lockwashers are available in many styles. The teeth are formed so as to rotate slightly and bite into the contact surface when they are compressed.

Sealing washers are used to provide a positive seal under a fastener. Most of them are one-piece assemblies consisting of an O-ring (or similar sealing device) bonded to an outer washer.

Finishing washers are used with flat-head and round-head screws to improve the appearance of screw fastenings, and are usually finished to match the finish of the screw head.

Preload indicating washers are designed to increase life of high strength bolts by allowing precision tightening. They consist of two concentric steel rings sandwiched between two close tolerance washers. The inner ring is smaller in diameter and higher than the outer. As assembly is tightened, inner ring is compressed until the loose outer ring is bound between the plain washers. When binding occurs, the proper load has been reached.

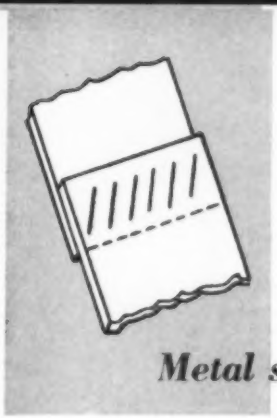
Plain washer

Split-spring washer

Finishing washer

Tooth-type lockwashers

External



Metal stitching...

Metal stitching consists of joining thin-section metal to other thin-section metal or to nonmetals by means of wire stitches. The process is gaining ever wider usage in the metalworking industry for assembling parts fabricated of steel, aluminum, copper, rubber, leather, wood and plastics.

Stitching offers many advantages: speed of application, no pre-punching or drilling of holes required, no clamping of work, no special pre-cleaning of work required, joints have excellent vibration resistance, and equipment costs are relatively low.

Three terms need definition: stapling, stitching and tacking. Stapling usually implies the use of pre-formed fasteners. Stitching denotes the operation wherein a length of wire is cut from a coil and formed into a fastener as each stitch is made. In both cases the stitch passes through the material and is clinched on the other side. When the stitch does not go all the way through the material, the operation is called tacking.

Types of Stitches

Stitching machines are designed to produce either a curved or a flat stitch. Curved stitches (similar to those made by paper staplers) are used in about 95% of all stitching operations. Flat stitches are used when the joint must carry substantial loads, such as aircraft applications where the joints are stressed. The flat stitch, however, is not suitable for the heavier gages of steel or over ¼ in. of nonmetallic material.

Capacity

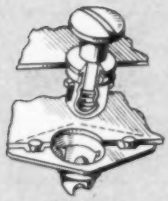
The thickness of material that can be joined is governed by the material, its hardness, the size of the machine, and the size and hardness of the wire used. About 98% of all stitching is done with 18-gage (0.0475 in.) steel wire.

METAL STITCHING CAPACITY

Metal	Metal-to-Metal thickness, in. (1)		Metal-to-Non-metal thickness, in. (2)	
Aluminum (soft)	0.093	0.093 (3)	0.125	1/2 in. sheet cork 1/4 in. sheet asbestos 1/2 in. fiber 1/8 in. phenolic 3/16 in. plastic 3/8 in. wood
Aluminum (hard)	0.040	0.040 (3)	0.064	
1010 CRS ($50R_b$)	0.050	0.050	0.080	
Stainless (full hard)	0.010	0.010	0.020	
Stainless (annealed)	0.020	0.020	0.040	
Sheet copper	0.035	0.035	0.064	

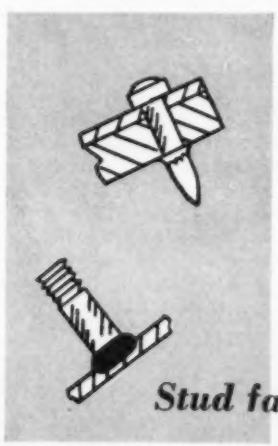
(1) Any combination of metals of maximum thickness may be stitched together.
(2) Any combination of metals and non-metals of maximum thickness may be stitched together.
(3) Flat or curved stitch; all others, curved stitch only.

Quick-release fasteners...



These fasteners are used for doors and panels, such as inspection doors, instrument covers, etc, where intermittent closing and opening is required and a positive lock is necessary. Most all operate against a spring, so some axial pressure is required while turning. And in most cases the fastener makes use of a cam action to lock the rotative member in place under spring pressure.

Installation is slow but operation is relatively fast. The bolt portion is supplied with a slotted head, to accept a screwdriver, or with a knurled or winged head for hand tightening. Usually a quarter of a turn is all that is needed to lock or unlock these fasteners. This contrasts with regular screw fasteners which must be rotated many complete turns to engage or disengage.

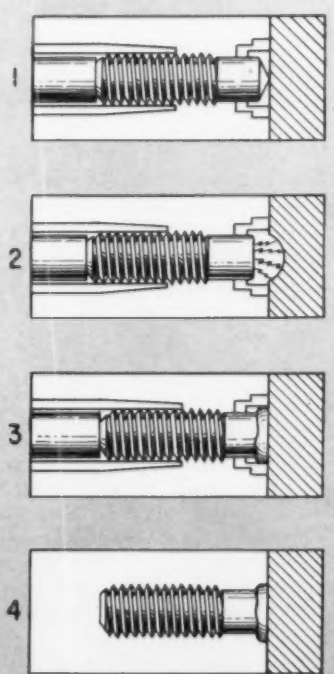


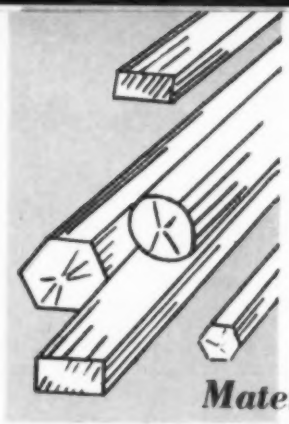
Stud fastening...

The Ramset fastening employs a powder-actuated gun to drive studs and pins into steel, concrete and other materials. The extruded or cold-headed fasteners are available in a wide range of styles and sizes.

The Hilti system, designed for driving studs and pins into concrete, masonry and steel, supports the fasteners in a hand-held drive tool while they are being driven with a hand hammer. Again, many sizes and styles of fasteners are available.

Nelson stud welding, a modified electric arc process, welds studs to metal plates. The studs are made of weldable metals and have granular flux attached to the welding end. A special welding gun is used to weld the studs. Studs usually range from ⅛ to 1 in. in diameter; there is no limit on the maximum plate thickness, minimum is 0.020 in. The pressure exerted is nominal, being provided by the main spring of the gun, which holds the stud in place until the weld is completed.





Materials...

Carbon steel fasteners comprise the majority of fasteners in use today. They can be made by cold or hot forming techniques. Manganese steels, chrome-nickel, chrome-vanadium, nickel-chrome-vanadium, and molybdenum steels are used when increased toughness, high tensile strength or fatigue strength are required.

Stainless steels offer high-temperature strength, corrosion resistance, and a permanent bright finish.

Aluminum and aluminum alloys, both the hardenable and the non-hardenable types, are used for fasteners because of the good strength-to-weight ratio and a degree of corrosion resistance.

Titanium bolts and screws are used for high-strength aircraft applications. A recently introduced high-strength cold-heading titanium alloy should expand the use of titanium alloy rivets.

Nickel alloys, copper alloys and copper are widely used, and plastic fasteners are finding wide use in low-tensile applications.

Acknowledgement

The following companies gave time, information, and aid for this report, and we would like to thank them all:

Allen Mfg Co
Allmetal Screw Products Co
Aluminum Co of America
American Chain & Cable Co
American Screw Co
American Sealants Co
Bethlehem Steel Co
Boots Aircraft Nut Co
Briles Mfg Co
Bristol Co
Brush Nail Expansion Bolt Co
Buffalo Bolt Co
Burklyn Co
Camloc Fastener Corp
Chase Brass & Copper Co
Cherry Rivet Div, Townsend Co
Chicago Rivet & Machine Co
Chicago Screw Co
Circon Component Co
Clark Bros Bolt Co
Cleveland Cap Screw Co
Deutsch Co
Driv-Lok Pin Co
Eaton Mfg Co, Reliance Div
Elastic Stop Nut Corp of America
Erie Bolt & Nut Corp
Fabristeel Products
Fastex, Div of Illinois Tool Works
Ferry Cap & Set Screw Co
Fischer Special Mfg Co
General Tire & Rubber Co, Industrial Products Div
John Gillen Co
B F Goodrich Ind Products Co, Rivnut Div
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Hi-Shear Rivet Tool Co
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Long-Lok Corp
Mac-it Div, White Sewing Machine
MacLean-Fogg Lock Nut Co
Maryland Bolt & Nut Co
Milford Rivet & Machine Co
J I Morris Co
National Machine Products Co
National Screw & Mfg Co
Newton Insert Co
Nylogrip Products Co
Nylok Corp
Nylok-Detroit Corp
Nutt-Shel Co
W H Ottemiller Co
Palnut Co
Parker-Kalon Div, General American Transportation Corp
Pittsburgh Screw & Bolt Corp
Pylon Co
Ramset Fasteners, Div of Olin Mathieson Chemical Corp
Republic Steel Corp
Reynolds Metals Co
Rosan Inc
Rotor Clip Co
Russell, Burdsall & Ward Bolt and Nut Co
Edward Segal
Shakeproof, Div of Illinois Tool Works
Shur-Lok Corp
Simmonds Aerocessories
Simmons Fastener Corp
Southco Div, South Chester Corp
Southern Screw Co
Standard Pressed Steel Co
Edwin B Stimpson Co
Judson L Thomson Mfg Co
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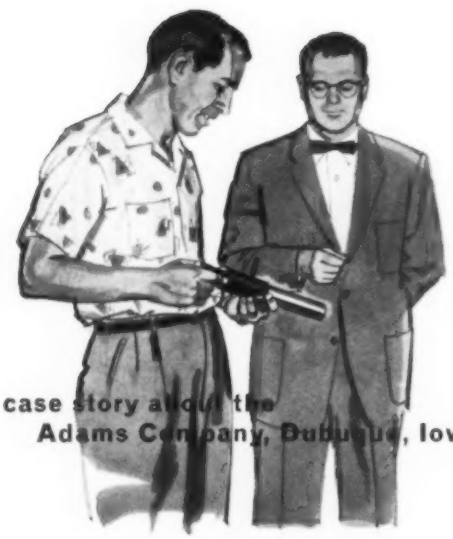

A case story about the Adams Company, Dubuque, Iowa

Before Standard Oil lubrication specialist Bob Wenger told The Adams Company management about Standard's SPECIAL TRANSPARENT COOLANT, there had been considerable trouble with rusting of work and machines in the plant. There had also been trouble with deposits on the ways of the grinding machines. Rust occurring on parts being processed was resulting in damage and even losses. This has been changed.

"Since we changed to your SPECIAL TRANSPARENT COOLANT, we have not had any rusting or deposits on our machine tools, and this product has eliminated the rusting problem on parts being processed through our plant," says Harlow Adams, president of the company.

The Adams Company found they received important additional benefits as well. Operators could now see their work clearly. There was less wheel loading. Because the coolant didn't foam, more of it stayed on the wheel resulting in cooler operation. Faster cuts were obtained with finer wheels. Finer wheels gave better finishes. Periods between dressings were extended. Tolerances were maintained.

Research, development and more than two years of field testing have gone into Standard's SPECIAL TRANSPARENT COOLANT. This is the pay-out to you on the research done by Standard Oil to bring you better metalworking products. Find out more about Standard's SPECIAL TRANSPARENT COOLANT. Call your nearby Standard Oil lubrication specialist in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about
Special Transparent Coolant

- Clear, transparent fluid.
- Able to control corrosion and rust on work and machines.
- All chemical. Does not support bacteria growth.
- Unaffected by humidity.
- Nonfoaming.
- Fire resistant.
- Odorless.

No rust. Shaft ground with Standard's SPECIAL TRANSPARENT COOLANT shows no rust on inspection by A.T. Murphy, General Superintendent, Harlow Adams, President, and Bob Wenger, Standard Oil lubrication specialist.

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True-Position Tolerancing—VII

WALTER H HARRINGTON, engineering standards coordinator,
Research and Advanced Development Div, AVCO MFG CORP, WILMINGTON, MASS
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In Fig. 22, the first hole may be located by: (1) a three-place decimal dimension, controlled by the block tolerance of ±0.010 in., (2) a three-place decimal dimension, adding the word "Basic" and thereby controlling the dimension by true-position tolerance given as 0.010 in.; or (3) a high and low limit dimension, controlled by its own limits. If methods 1 or 3 are used to locate the first hole, true-position tolerance applies to control of the other three holes.

Fig. 23 illustrates pin-in-hole conditions which could happen with centers varying within the true-position circle.

In Fig. 24, all holes are located on a straight centerline and the linear position of each hole is specified by basic dimensions. Note that chain dimensions can be used because true-position tolerances are not cumulative. There is a true-position variation between one hole and other, but no accumulation of tolerances.

DIMENSIONS FROM A DATUM

Datum points, lines or surfaces are features of a part which are assumed to be exact for purposes of computation or reference, and from which the location of other features of the part may be established. Where positions are specified by dimensions from a datum, different features of the part are located with respect to this datum and not with respect to one another.

SELECTION OF A DATUM

Features which are selected to serve as datums must be clearly identified and easily recognizable. To be useful for measuring, a datum on an actual piece must be accessible during manufacture. Also, corresponding features on mating parts must be used as datums to insure assembly and facilitate tool design.

ACCURACY OF DATUM SURFACES

A datum surface on an actual piece must be more accurate than

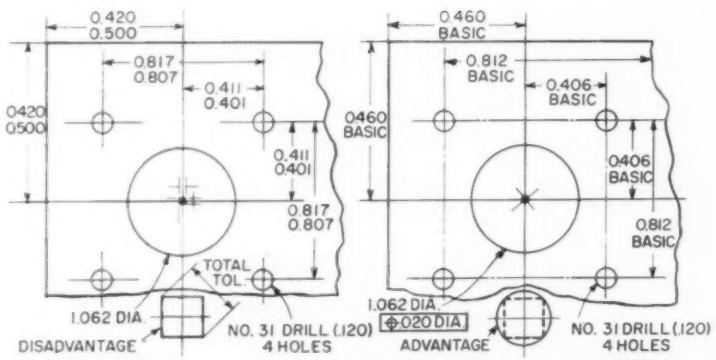
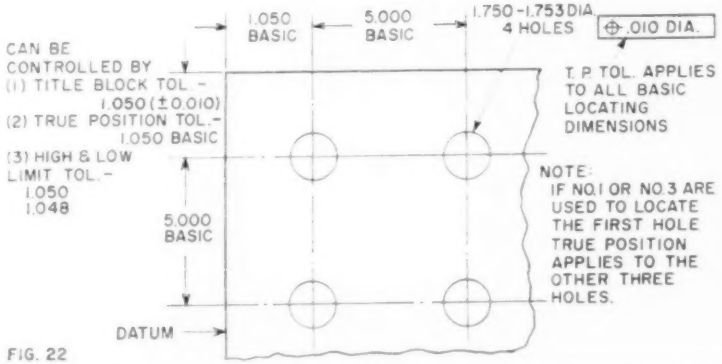
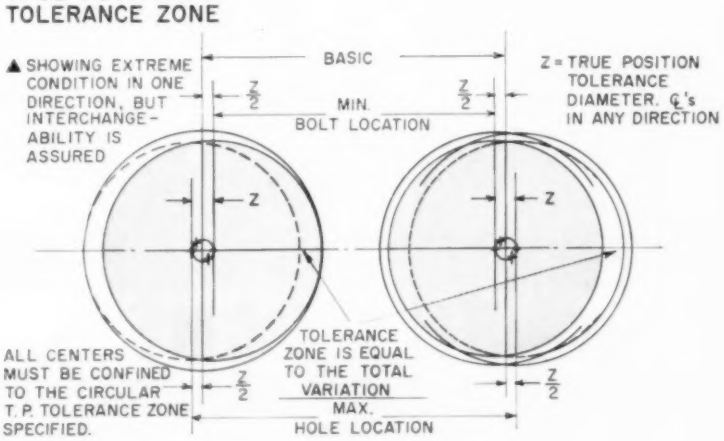


FIG. 21


1.050
BASIC
5.000
BASIC
1.750-1.753 DIA
4 HOLES
⌖.010 DIA.
CAN BE CONTROLLED BY
(1) TITLE BLOCK TOL. - 1.050 (±0.010)
(2) TRUE POSITION TOL. - 1.050 BASIC
(3) HIGH & LOW LIMIT TOL. - 1.050 / 1.048
T.P. TOL. APPLIES TO ALL BASIC LOCATING DIMENSIONS
NOTE:
IF NO.1 OR NO.3 ARE USED TO LOCATE THE FIRST HOLE TRUE POSITION APPLIES TO THE OTHER THREE HOLES.
5.000
BASIC
DATUM
FIG. 22


TRUE POSITION TOLERANCE ZONE
▲ SHOWING EXTREME CONDITION IN ONE DIRECTION, BUT INTERCHANGE-ABILITY IS ASSURED
BASIC
Z/2
MIN. BOLT LOCATION
Z/2
Z = TRUE POSITION TOLERANCE DIAMETER. ℄'s IN ANY DIRECTION
Z
Z
ALL CENTERS MUST BE CONFINED TO THE CIRCULAR T.P. TOLERANCE ZONE SPECIFIED.
Z/2
TOLERANCE ZONE IS EQUAL TO THE TOTAL VARIATION
MAX. HOLE LOCATION
Z/2
FIG. 23

◀ CIRCLE 279 READER SERVICE CARD

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True-Position Tolerancing—VIII

any locations established by measuring distances from the datum. Thus, if measurements are made from a datum surface to establish hole locations, with a tolerance of 0.010, the total effect of surface inaccuracies on the measurements must be less than 0.010, or the locations will not have the specified accuracy. It may be necessary to specify the accuracy of a datum surface by giving tolerances on straightness, flatness, roundness, etc.

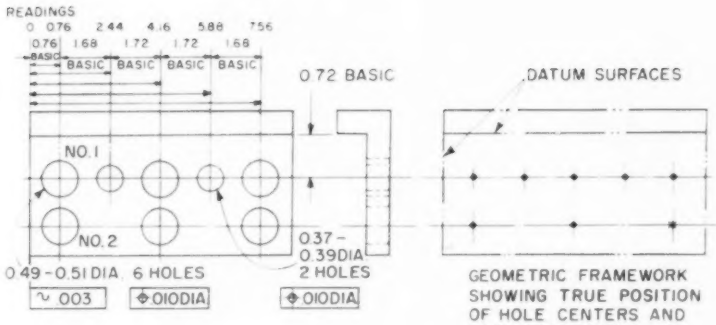
MMC AS RELATED TO POSITIONAL TOLERANCES

Extracted from American Standard Drafting Manual, "Dimensioning and Notes," ASA Y-14-5-1957, with the permission of the publisher, the American Society of Mechanical Engineers, 29 West 39th St., New York 18.

Maximum-material condition (MMC) by itself means that a feature of a finished product contains the maximum amount of material permitted by the toleranced size dimensions shown for that feature. As a general rule, tolerances of position are determined by the specified maximum material condition of mating features.

To carry on interchangeable production efficiently, precautions must be taken to make sure that parts can be freely assembled. Fixed gages, made to simulate mating features at dimensional limits that make assembly most critical, can be used to assure free and proper assembly by simple and economical inspection methods.

Under some dimensioning systems, there has been a lack of adequate means to indicate proper tolerance conditions. This lack has permitted various interpretations of the tolerances, which have not



▲ TRUE POSITION TOLERANCES ARE NOT CUMULATIVE, BECAUSE UNTOLERANCED BASIC LOCATION DIMENSIONS ARE USED.

▲ TRUE POSITION IS ALWAYS ESTABLISHED WITH REFERENCE TO A DATUM.

FIG. 24

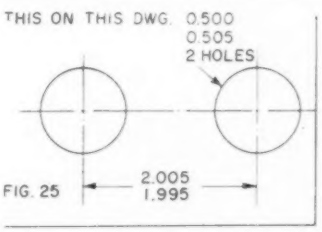


FIG. 25

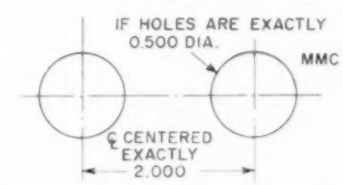
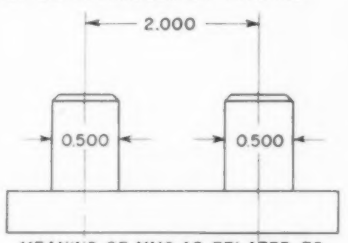


FIG. 25A

THE HOLES WILL THEORETICALLY RECEIVE THE PINS OF THIS GAGE

1. IF WORK IS PERFECT WITH NO VARIATION
2. MUST BE ASSEMBLED BY MACHINE



MEANING OF MMC AS RELATED TO POSITIONAL TOLERANCE

FIG. 25B

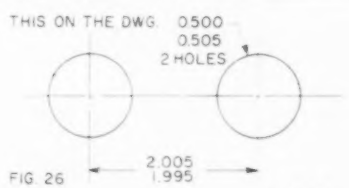


FIG. 26

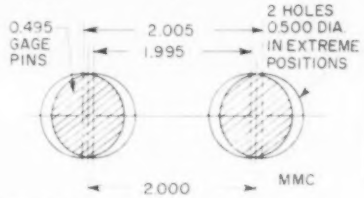


FIG. 26A

WITH HOLES IN EXTREME POSITIONS, PINS WOULD HAVE TO BE 0.005 SMALLER OR 0.495 DIA. TO ENTER THE HOLES

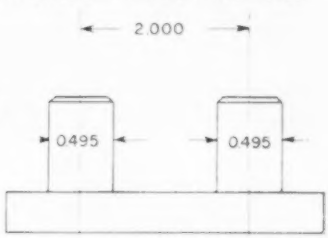
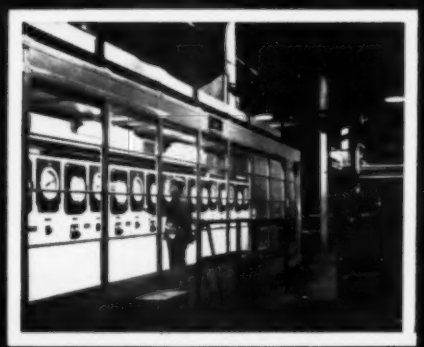


FIG. 26B

ARISTOLOY



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True-Positioning Tolerancing—IX

always been in agreement with the designer's intent.

For example, two ½-in. holes are specified on a drawing, as shown in Fig. 25. If the holes are exactly 0.500 in. dia (the maximum-material condition, or the smallest size hole permitted by the drawing specification) and are centered exactly 2.000 in. apart, they will theoretically receive a gage consisting of two round pins fixed in a plate, if the pins are centered 2.000 in. apart and are 0.500 in. dia (Figs. 25 *A* and *B*).

However, the limits specified on the drawing permit the center distance between the holes to be from 1.995 to 2.005 in. The pins in the gage would therefore have to be 0.005 in. smaller, or 0.495 in. dia, to enter the holes in their extreme positions as shown in Figs. 26 *A* and *B*. If the holes are exactly 0.500 in. dia, but located at the maximum permissible center distance, the 0.495 in. dia gage pins would contact the inner sides of the holes, because the distance between the inner sides of the gage pins is 1.505 in. (Fig. 27 *A*). If the holes are exactly 0.500 in. dia, but located at the minimum permissible center distance, the gage pins would contact the outer sides of the holes if the distance between the outer sides of the gage pins is 2.495 in. (Fig. 27 *B*).

Neglecting gagemakers' tolerances, the gage pins would have to be 0.495 in. dia and the centers located exactly 2.000 in. apart. Thus, the holes in the part, if they are 0.500 in. size, will fit the gage pins if located within the limit locations on the drawing.

Now if the holes are at maximum size 0.505 in. dia, permitted by the drawing specifications, they will be accepted by the gage if the inner sides of the holes contact the inner sides of the gage pins. This means that the holes will have a center distance of 2.010 in., which is outside the center distance limits specified (Fig. 28 *A*). These holes will also be accepted by the gage when their outer sides contact the outer sides of the gage pins at a center distance of 1.990 in. (Fig. 28 *B*). This again is outside the center distance limits specified on drawing.

When this condition is acceptable, the product drawing should be dimensioned as in Fig. 29. It is desirable to have a generally accepted method of indicating on the toleranced center distances, that the limits of center distances must be observed only if the features are on their maximum-material limits of size.

To be continued in an early issue.

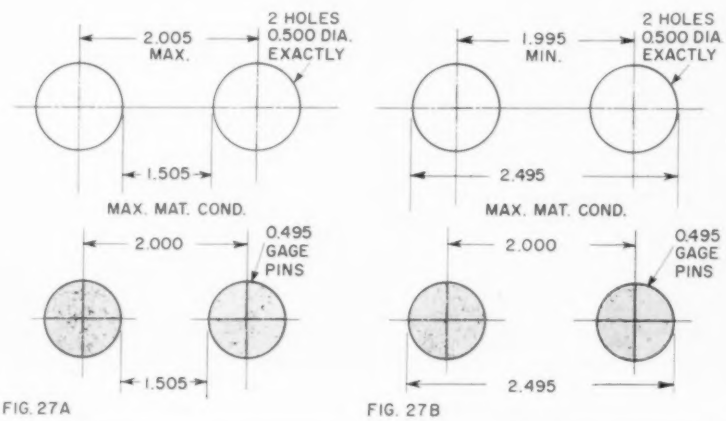


FIG. 27A FIG. 27B

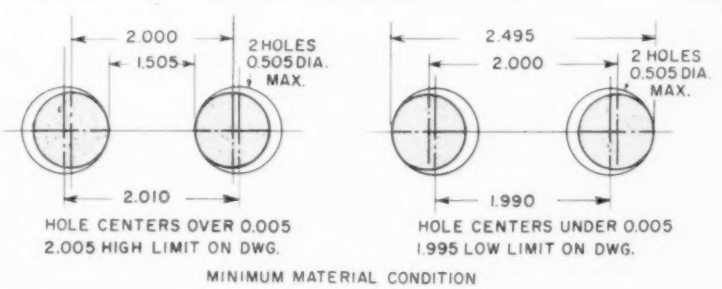


FIG. 28 A FIG. 28 B

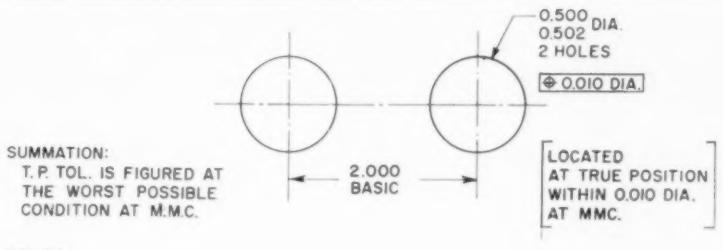


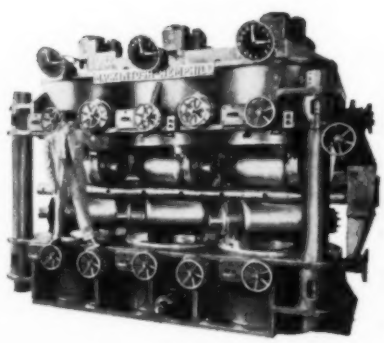
FIG. 29

...ALL SIZES STRAIGHTENED AND PERFECTLY ROUNDED ON MACK-HEMP ROTARY TUBE STRAIGHTENERS

Tubes of any alloy in any O.D. from .050-inch to 16 inches are production straightened and rounded at speeds up to 800 feet per minute or better. The six driven rolls are fully adjustable to suit tube diameter, amount of straightening bend needed, and correct contact grip on the tube. The machine operates without speed-limiting, surface-marring guides and the finished tubing shows no spiral markings.

All models—from the smallest to the largest—are now available in Mack-Hemp's exclusive new three-post construction.

For complete details of Mack-Hemp straighteners, write today for a free copy of our 24-page Technical Bulletin No. 55-A, "How to Straighten Pipe and Tube".



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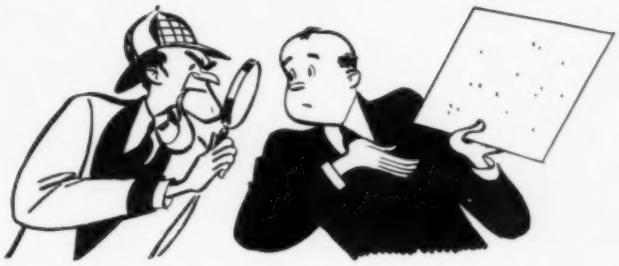
CIRCLE 282 READER SERVICE CARD

Talking Shop...



Columbium Again?

JUST WHEN we are getting adjusted to calling the metal niobium, after a lifetime of calling it columbium, comes word that American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) is sticking with columbium. It was the American Chemical Society and the National Research Council that concurred in the adoption of niobium (in 1949) by the International Union of Pure and Applied Chemistry. Whether they call it columbium or niobium, the stuff is so difficult to handle that production men will be calling it quite a few other names before they're through.

Extruded Sponge

SILICONE SPONGE is now extruded by a technique developed by Stalwart Rubber Co. Result is an economical way to produce sponge in special shapes required for sponge parts. Stalwart reports that a set of extrusion dies for a special shape can usually be developed for less than $100.

House Organs

OUR DAY is often brightened by the assorted publications that reach our desk from metalworking companies. Belatedly we want to pay tribute to *The Houghton Line* which recently celebrated its 50th Anniversary. Aaron Carpenter, who is chairman of the board at E F Houghton, has edited the *Line* for the last 21 years, modestly terming himself the "near-editor." The *Line* has a host of readers that belie the editor's modesty. We enjoy it ourselves and have occasionally lifted ideas from it (with credit, we hope) that we found especially appealing.

Another unusual house organ is *Miniaturesque*, published by Miniature Precision Bearings, and probably the smallest of its type in the country. From the current issue we quote some advice on how to deal with any exuberant and ill-informed car salesmen you encounter:

"Morning, sir — interested in the Pantherfang Flame-Flite 4 — U? It's a fabulous hunk of car, and — — —"

"Mmmm. I suppose the carburetion employs the split-spray convection system, using preheated twin baffles?"

"Uh, well — —"

"The suspension assembly, of course, has been re-designed to utilize lap-fitted cradles, spring-loaded with royal jelly, under finger-tip control?"

"I'll find out, sir. Now, just drink in the christen of the gloam — uh, the *glisten* of the *chrome*—"

"Thanks, I don't drink at this hour: now about the variable ratchet on the distributor spindle; is it, or is it not, chamfered?"

"Well, — it's a gorgeous heap of car — —"

"I see, But rather vintage, isn't it?"

"Look — just drink in th— —"

MEMOS

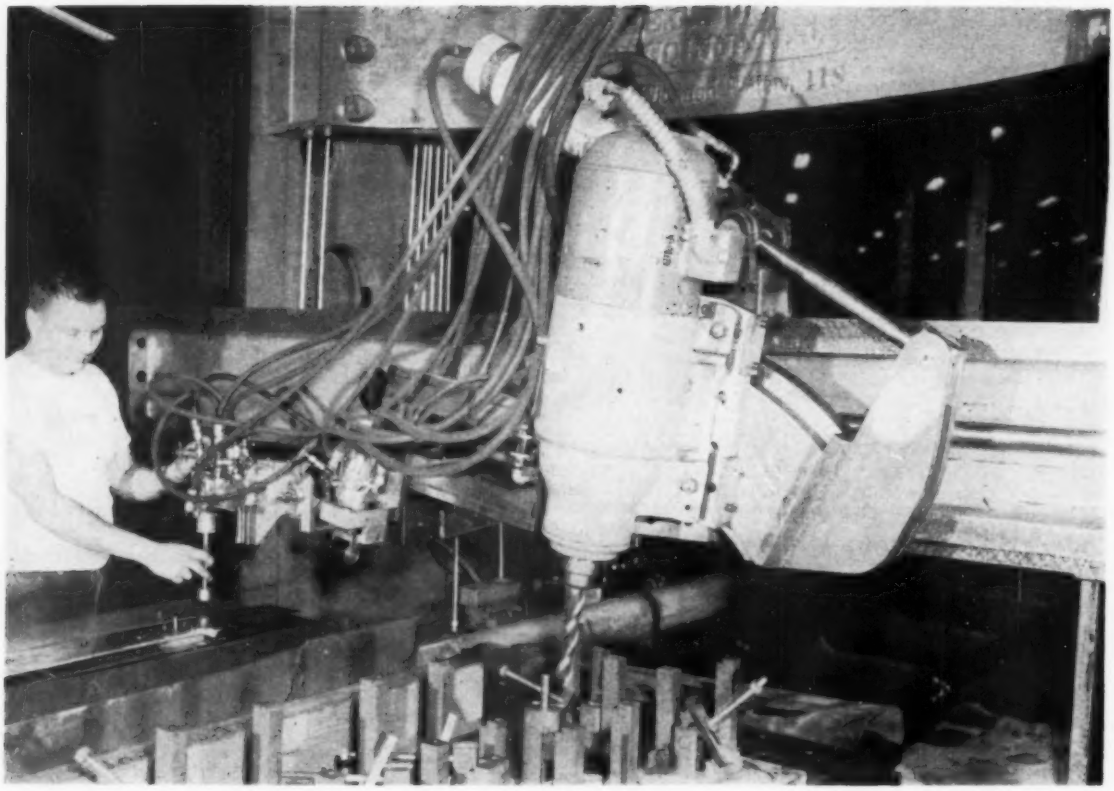
by BESS RITTER

In the Middle Ages iron (meaning a metal) was spelled in approximately fifty different ways: Some called it "iyrne," others called it "hyrone," and still others call it "isarn," to name but three examples. It didn't become known as "iron" only, until the time of Queen Elizabeth, but that didn't clear things up very much either, because people cultivated the habit of calling many different articles which apparently were made of iron, as "irons" also. This seems to be too confusing to be true, however, we still indulge in this habit to this day:

Convicts call their fetters "irons."
Sportsmen call their golf clubs "irons."
Harpoons are sometimes known as "irons."
Housewives call their pressing equipment and their hair-curling equipment "irons."
Cowboys call their branding equipment and their pistols, "irons" as well.

Although "prayer wheels" are practically unknown today, approximately thirteen hundred years ago, any good mechanic in various sections of Europe could make a good living constructing such devices, which were used in churches. They were great big wheels—about as wide across as a man is tall —and were usually suspended from church ceilings.

They were employed in this interesting manner: When a supplicant had a request to make of God, he spun the wheel while he murmured an appropriate prayer. When it stopped he'd know whether the prayer would be answered, by observing the direction in which one of the spokes now pointed. This machinery seems too odd to be true, but one model is still in existence in France, in the chapel at Comfort. It's reputed to be more than 700 years old.



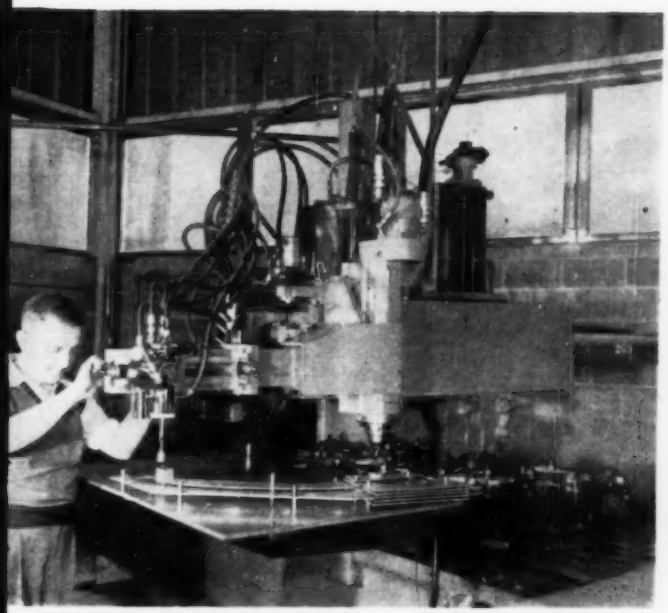
Swarfing and contouring combined . . . .
Gray planer makes swarfing, propeller-blade cuts when 5-in. air cylinder pushes or pulls curved bracket, which tilts four-speed Lima motor and spindle up to 18° either way. Swarfing control is from a vertical templet mounted on the side of the machine; this moves a True Trace valve that actuates the cylinder. Operator (left) is adjusting follower spindle to horizontal contour templet, which controls slide motions at same time. Contouring cylinder is to right on cross-rail (out of view), similar to machine below

Hydraulic Tracers Convert

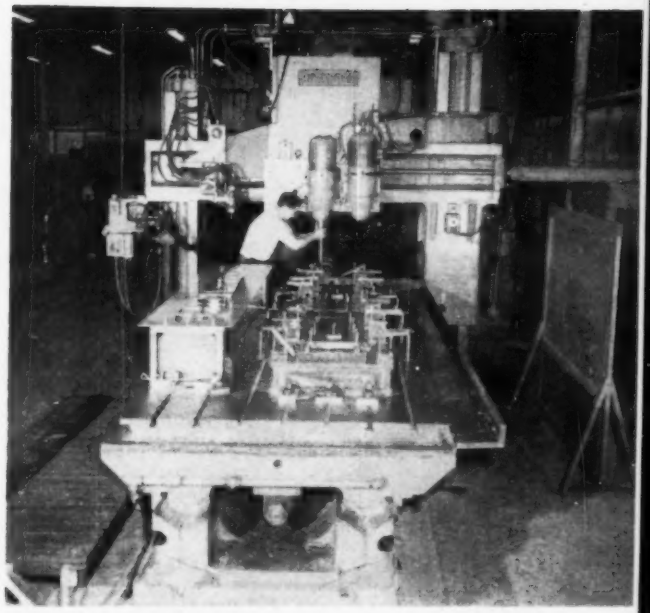
William N Engel,
chief engineer,
H & B American Machine Co,
Indianapolis

Standard planers now do precision contour milling on airframe components. Six machines were converted or modernized, with hydraulic power cylinders and templet-following tracer valves added, and useless features stripped away. Rack-and-pinion table drives have been replaced by double-acting hydraulic cylinders that provide variable table feed and smooth operation. Crossrail feeds and some vertical feeds have also been replaced by hydraulic cylinders, served at each machine by a 10-hp motor and 250-psi hydraulic unit. One machine has a slide-tilting mechanism also operated from a templet, which allows swarfing cuts. Conversions were inexpensive, and have reduced tooling costs.

Independent positioning controls . . . .
Converted H & H openside planer has two manual valves on end of cross-slide so slide and table can be rapid-traversed and positioned independently of contour templets. Part is a forged aluminum wing spar. Cutter is driven here by four-speed Lima motor

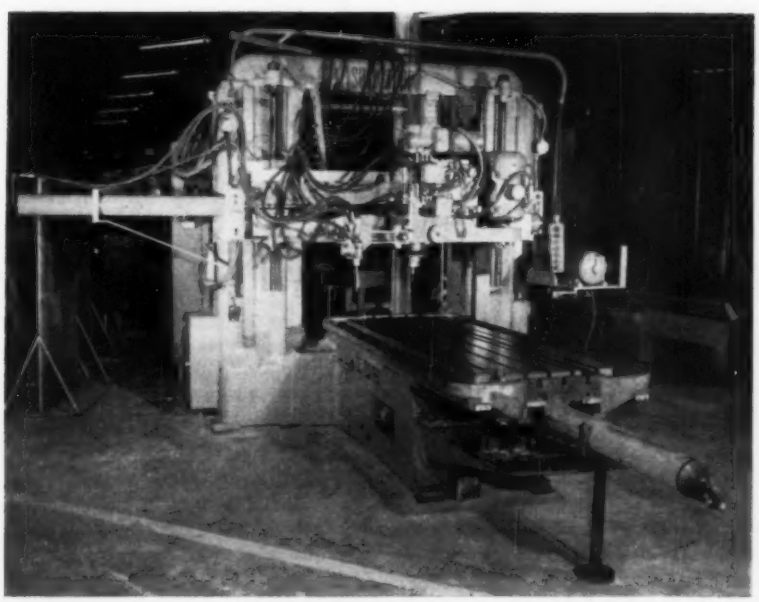


3-D milling . . . .
Detrick & Harvey openside planer has a high-speed Romulus spindle driven by a Denison hydraulic motor. Long air cylinder at rear has 36-in. stroke, moves slide on cross-rail. Shorter vertical cylinder behind head moves spindle vertically on slide. Control is from one or two table templets, through 3-D True Trace valve. Two work fixtures can be located on the table, which is powered by a third hydraulic cylinder mounted between machine ways



Two independent spindles . . . .
Rockford hydraulic planer now has two 10-hp Lima gearshift motors, one on a vertically adjustable slide and one fixed to the saddle. Original Kopy Kat tracer control was replaced by 3-D TT valve that operates table, saddle, and vertical slides. Kopy Kat is now tied in with 8-position turret stop that sets vertical spindle height for two-dimension tracing. Original hydraulic cylinders move table and vertical slide; a new 6-in. double-acting cylinder operates the saddle

Planers into Contour Mills



War-surplus Sundstrand No. 22 Rigidmil was converted for tracing airframe parts by removing one spindle assembly and adding table and saddle cylinders with two dimension tracer valve. Table cylinder in foreground has 8-ft stroke; saddle has 4-ft stroke. Motor drive lifts cross-rail

Practical Ideas...

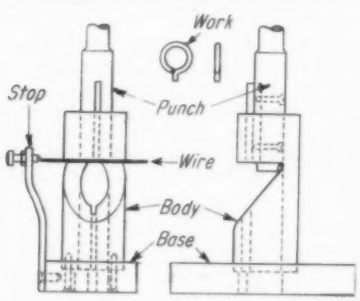
Machining Dust Eliminated With Vacuum Cleaner

The illustrated setup has actually solved two problems in drilling deep large-diameter holes in graphite. First, the rounded land edge of the replaceable bit provides a burnishing effect on the hole. We have drilled holes up to five inches in diameter from the solid without chatter or bell mouthing at either end.

Second, the vacuum cleaner arrangement removes the cause of the major objection to machining graphite, the dust. It is drawn through the hollow boring-bit holder and a flexible hose into the vacuum cleaner. Once the bore has been started, very little graphite dust escapes out to the machine proper.

The boring-bit holder is a length of pipe, or heavy tubing, which is slotted to receive the easily made bit. See photo detail. Connection between an industrial-vacuum cleaner and the back end of the holder is made with the cleaner's own flexible hose.

John McDonald, laboratory instrument maker, General Atomic, San Diego, Calif



Economy Forming Tool

Recently we had to fill an order for a large number of wire loops which were later to be riveted to special nippers as a safeguard against loss. The cost of tooling played an important part because this was one of those 'extra' jobs not taken into account, so the tools had to be as simple as possible.

The form tool shown was constructed at a cost of only $20, an almost painless expense. We used ⅛ in. dia Swedish iron wire to make the loops because this material is ductile and has very little springback. Several hundred pieces per hour were produced by handfeeding precut, lubricated pieces of wire.

The body of the tool is machined like a plain bushing with keyway running the full length of the bore. The bore is 1-in. dia and the keyway deep enough to allow for the length of the stem, and wide enough to provide side clearance for the wire.

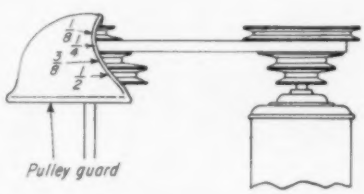
A whistle cut, through the side of the body on the keyway side and through the bore, creates the forming edge and wire nest. Note that the forming edge is deeper on the side whre the longer end of the wire is located. This is designed to produce a catch for the right-angle bend of the stem. The entire forming edge is well rounded and polished to ease forming and to prevent cutting the wire.

An external adjustable stop, fastened to the side of the body, positions the wire to allow for the stem on the side of the stop. A recessed baseplate is screwed to the bottom with countersunk machine screws.

The punch is machnied to a sliding fit in the bore with a ¾ in. dia neck at the bottom end. Two small screws hold a key in the keyway of the punch. To support the stem of the loop the key must be flush with the punch shoulder.

About eight loops will cling to the inside of the bore after they have been formed. After that, each additional loop formed will eject the bottom loop into a tote pan.

J P Essex, Sussex, England

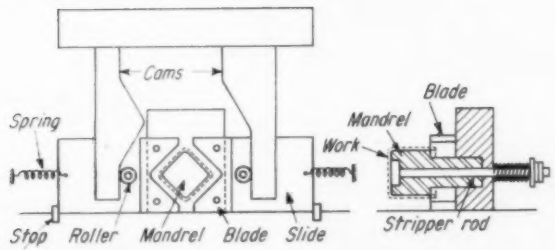


Speed Identification

End mills are often needlessly dulled and sometimes burned because spindle speeds are too fast. On the other hand, production suffers when the spindle speeds are too slow.

By marking the machine near the spindle pulley, you can eliminate guesswork and waste. The illustration shows how we have marked the pulley guard with the maximum-size cutter for each sheave. This method makes speed selection simple and practically foolproof.

Walter Gerstel, Berkeley, Calif



Reciprocal Cam Action Trims Square Cans

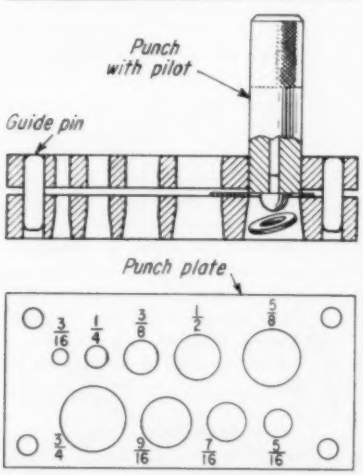
When a metal blank is drawn into the form of a square can, the edges will be ragged and need trimming. Many kinds of trimmers have been designed to do this job but, as a rule, only the more elaborate are satisfactory.

The illustrated tool is one of the exceptions to the rule. It works on a simple principle employing two cams which activate two cutters in a reciprocating motion, each cutter trimming two sides of the can. Guides and other details of construction are not shown in sketch because of clarity.

The two blades, made of tool steel and hardened, are mounted on guided movable slides which return to open position with the aid of springs. Cam rollers mount on the side of the slides. The mandrel on which the cams are nested is also made of tool steel and hardened. The stripper rod running through the mandrel is spring returned and can be either manually activated or automated.

Good material should be used in the cams, not necessarily tool steel but at least a steel that can be flame hardened on the striking surfaces. All other parts are C.R.S. Cam contours should be machined as shown in the sketch so when the first cutter has finished its cut the other starts moving in.

Federico Strasser, Santiago, Chile



Washers Are Easy to Make With Bench Die Plate

Washers and ring gaskets of fiber, hard rubber, leather, or metal are needed in virtually every branch of the metalworking industry and related trades. They can be produced in a number of ways but one of the simplest is to punch them out on a die plate.

The sketch at left shows one of the smaller die plates we use for this work. It will produce holes from 3/16 to 3/4 in., each hole being 1/16 in. larger than the one it precedes. All our dies combined give us holes from ⅛ in. to 1 in. in increments of 1/32 in.

A die is made up of two plates; one is the punch guide, and the other the die. The guide, or top plate, may be made from any kind of steel but the die, or bottom plate must be of good quality die steel. The thickness of the guide plate is ½ in. while the die plate is ⅝ in. Larger dies should be correspondingly heavier. After both plates have been face ground they are pinned together at the corners with dowels. Sides and ends are then cleaned up on a shaper or miller, and all sharp edges removed with a file.

Hole sizes are made to individual requirements, but should be arranged and laid out as the sketch shows for maximum strength. The holes are most accurately and conveniently bored on the faceplate in a lathe. When bored from the underside, punch clearance and the taper for slug clearance are easily machined in the same setup. The die plate is hardened, after all machining has been completed, to 59-60 R_c.

Punches are made of drill rod and machined with a concentric through hole to receive pilots. These pilots insure accurately concentric washers and ring gaskets. With the die placed on a smooth flat surface, a hammer blow will be all that is needed on the larger punches to pierce most light materials, but an arbor press may be necessary for stock of more resistance.

Raymond Pajer, supervisor—tool room, Greist Mfg Co, New Haven, Conn

Heat Restricted by Raw Potato

It is sometimes necessary to confine soldering and brazing heat on the workpiece to a small area and thus prevent similarly joined parts from separating. Repair work on light-gage materials such as cans, tanks, or musical brass instruments presents distinct heat-control problems. Breaks are often so close to soldered seams that, without some means of keeping the solder below melting point, they would open up.

Our method of confining the heat to only areas where needed is simple. We cut and pack one or more raw potatoes where heat must not affect the work, and hollow it out where heat is to be applied for soldering or brazing. The water contents of a raw potato is enough to keep fixed seams intact.

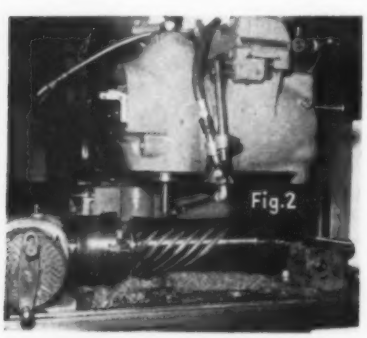
Nelson Hall, Detroit, Mich

Indicator-on-Templet Tracing Produces Form-Slab Milling Cutter

Sections of plane fuselage, made of aluminum, had to be machined to a specific radius on production basis. This indicated that a slab mill would be needed, but to order a special cutter would consume a lot of valuable time in delivery. We therefore set out to produce our own cutter without the benefit of specialized machinery.

First a blank was machined with a bore to suit our milling machine arbor and to the correct radius and diameter on the OD. It was then fitted on a mandrel and mounted on the miller between a center and a dividing head. Gearing the head to the longitudinal table feed produced the helical flutes desired.

In machining the flutes most of the metal is removed by a slightly smaller ball-end mill than the one used for finishing. See Fig 2. No attempt is made to follow the radius of the blank during this roughing operation. With the cutter vertical on the centerline of the work, the resulting cuts are consequently deeper at both ends.



The setup for finishing by tracing is shown in Fig 1. Here the miller head is tilted to 90°, and a ball-end milling cutter, large enough to finish the leading edge and the bottom of the grooves, is used. It is set behind the centerline of the work to produce a positive rake.

The templet mounts on heavy parallels, raising it to the centerline of the work. Templet being longer than the workpiece allows for run-out at each end. Two dial indicators, employed in unison, correlate the contours on the workpiece and the templet when the latter is positioned.

While the table moves under power feed, the operator maintains a zero setting on a dial indicator which contacts the templet. In repetitive-milling operations, all cuts must always begin at the same end to eliminate the dangers of backlash. Primary and secondary flute clearances are produced by resetting the head to intermediate angles after which tracing and cutting are carried out as before.

Richard Kennard, leadman, Grumman Aircraft Engineering Corp. Bethpage, NY

H KOSLOW
Bronx, NY

won **$25** in addition to regular payment for his idea:

MULTI-POSITION STOPS INDEX AUTOMATICALLY

in the June 30, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

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REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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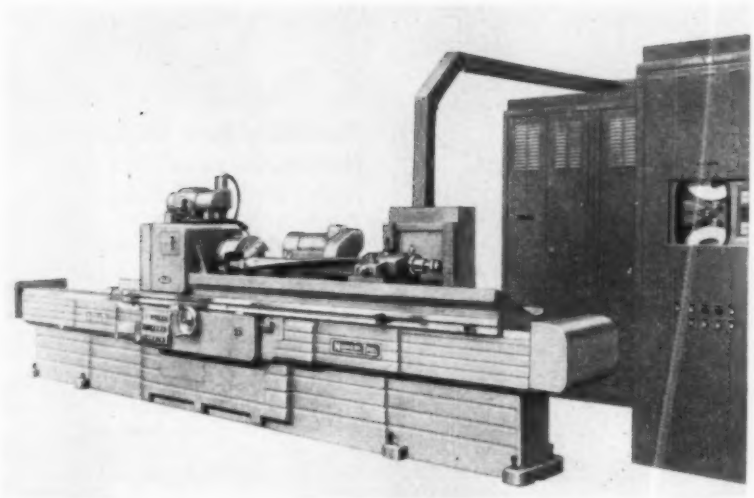
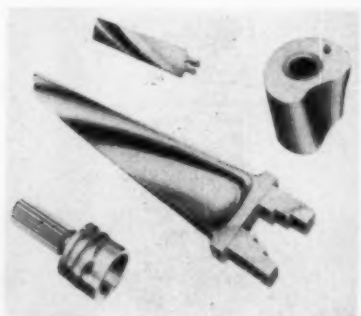
New Shop Equipment
Materials and Parts



Numerically Controlled 3-D Profilers Machine Around Axis of Workpiece

Numeri-Trol profiling machines are reported to be the first machines to perform numerically controlled three-dimensional milling around the axis of the work. Designed to produce such parts as cams, templets, and airfoil contours of steam turbine buckets and jet engine blades, the machines are also equipped for milling and grinding operations, and are said to be the first numerically controlled machines with grinding, dressing and dressing compensation.



TYPICAL PARTS produced on these machines include cams, steam turbine buckets and jet engine blades. No cams or special tooling are required for these complex parts

Parts having irregular and twisted forms can be machined without cams or special tooling. All instructions for machining are on tape. Tape preparation time varies with the complexity of the part, but it is only a fraction of the time required to make the conventional tooling to do the same work on a operator-controlled machine.

Control System

Ex-Cell-O designs and builds the machines only, not the control equipment. Any high performance numerical control system is adaptable. Of the first two machines, one operates through a magnetic tape system and electric servo motors, while the other uses punched tape and hydraulic servo motors. One machine turns out small-lot quantities of steam turbine buckets; the other produces cams, templets and prototype jet engine blades.

These machines were especially designed for numerical control. The cast base is ribbed for utmost rigidity; leveling pads and jackscrews permit perfect leveling and alignment of the base on its foundation.

Both table and cross-slide are actuated by preloaded leadscrew and nut assemblies, to permit accurately controlled table movement and to eliminate backlash. The worktable casting, weighing more than a ton, moves on V- and flat ways. The cross-slide, an aluminum casting designed to reduce the inertial forces, moves on roller assemblies interposed between hardened and ground ways.

Milling and Grinding

The cross-slide supports interchangeable milling and grinding assemblies. The milling unit consists of a spindle, a gear reduction motor and a chain drive, all mounted on a base. Carbide-tipped form-relieved cutters are used.

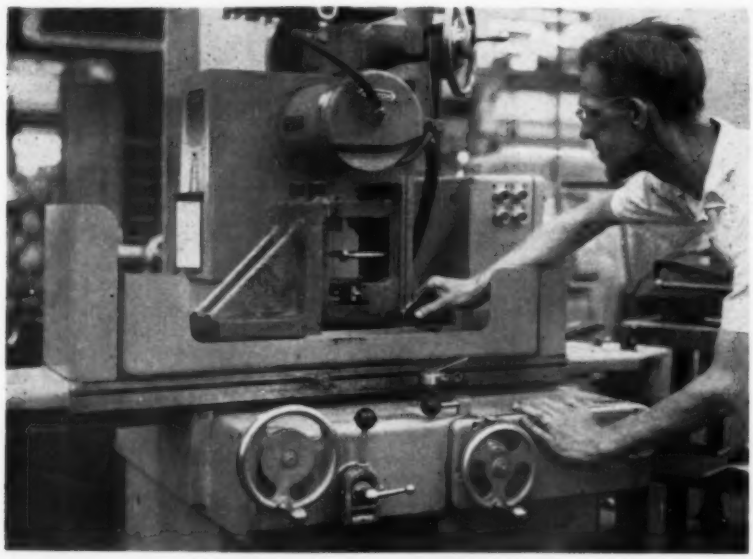
Several new features are found in the grinding assembly. It consists of precision grinding spindle with its drive equipment and a hydraulically operated swivel-type diamond dresser, all mounted on a base. The spindle is mounted on a small slide that provides axial movement; the dresser bracket is rigidly mounted to the base. An elongated cup-type grinding wheel is dressed to a spherical shape of a definite radius which is maintained throughout the life of the wheel.

By having the wheel spindle move toward the dresser, instead of having the dresser move, the position of the grinding wheel in relation to the work remains constant. Thus, dressing has the effect of an automatic sizing device.

The work is held between centers or in some workholding device. During grinding and in rotary milling one motor drives the work spindle, and through gears, also drives the leadscrew for the feed. Longitudinal milling is an alternate method, whereby the work feeds lengthwise in relation to the milling cutter, then indexes and feeds back. Thus, feeding and indexing continue until the work is rotated 360°. This operation requires two motors, one to index the work spindle and one to drive the leadscrew.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

MORE DATA? Circle 51, inside back cover



Norton Surface Grinder Reduces Grinding Time as Much as 50%

This 6x18-in. Type S-3 hydraulic surface grinder is reported to reduce grinding time by as much as 50% through the action of its high speed table. The maximum table traverse speed of 125 fpm also reduces burn, checking and cracking of the work.

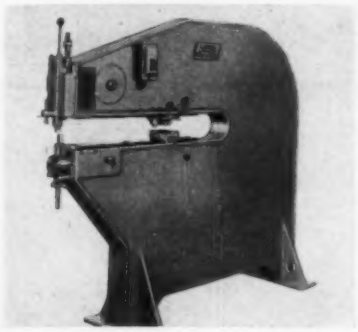
The machine can grind workpieces as high as 15 in. above the worktable with a standard 8-in.-dia grinding wheel.

Hydraulic cross-feed at each table reversal is set by a graduated knob. A two-speed vertical feed handwheel provides rapid movement for positioning and a fine feed, graduated in increments of 0.0001 in., for precision feed.

Optional equipment includes a 9-ipm vertical power positioning unit, magnetic or electric chucks, dust collector, integral motor spindle, and JIC electrical standards.

Norton Co, Worcester, Mass

MORE DATA? Circle 54, inside back cover



Sheet-Metal Shear and Forming Machine Comes in Three Sizes

Designated the MetlMastr, this machine is designed for circle and shape cutting, beading and forming of metal up to 0.281 in. thick. Model TE-165 (illustrated) cuts mild steel up to 0.165 in. thick; Model TE-218, up to 0.218 in. thick; and Model TE-281, up to 0.281 in. thick.

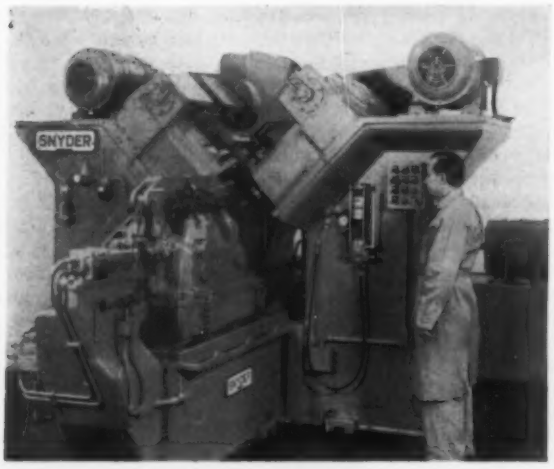
Square shearing, circle shearing (up to 49 in. dia inside throat) and freehand contour shearing up to 9/32 in. metal thickness are within the capabilities of this machine.

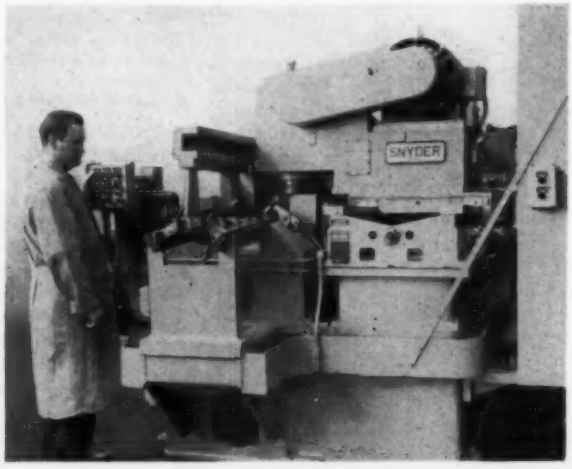
A cam action provides vibrationless operation. Material is not punched; it is sheared.

Machine is 86 in. front-to-back, 24 in. wide and 66 in. high. Drive is furnished by a 1½-hp motor. Cutting speeds range from 10 to 36 fpm, depending upon gage and material.

Lennox Tool & Machine Builders, Lima, Ohio

MORE DATA? Circle 55, inside back cover





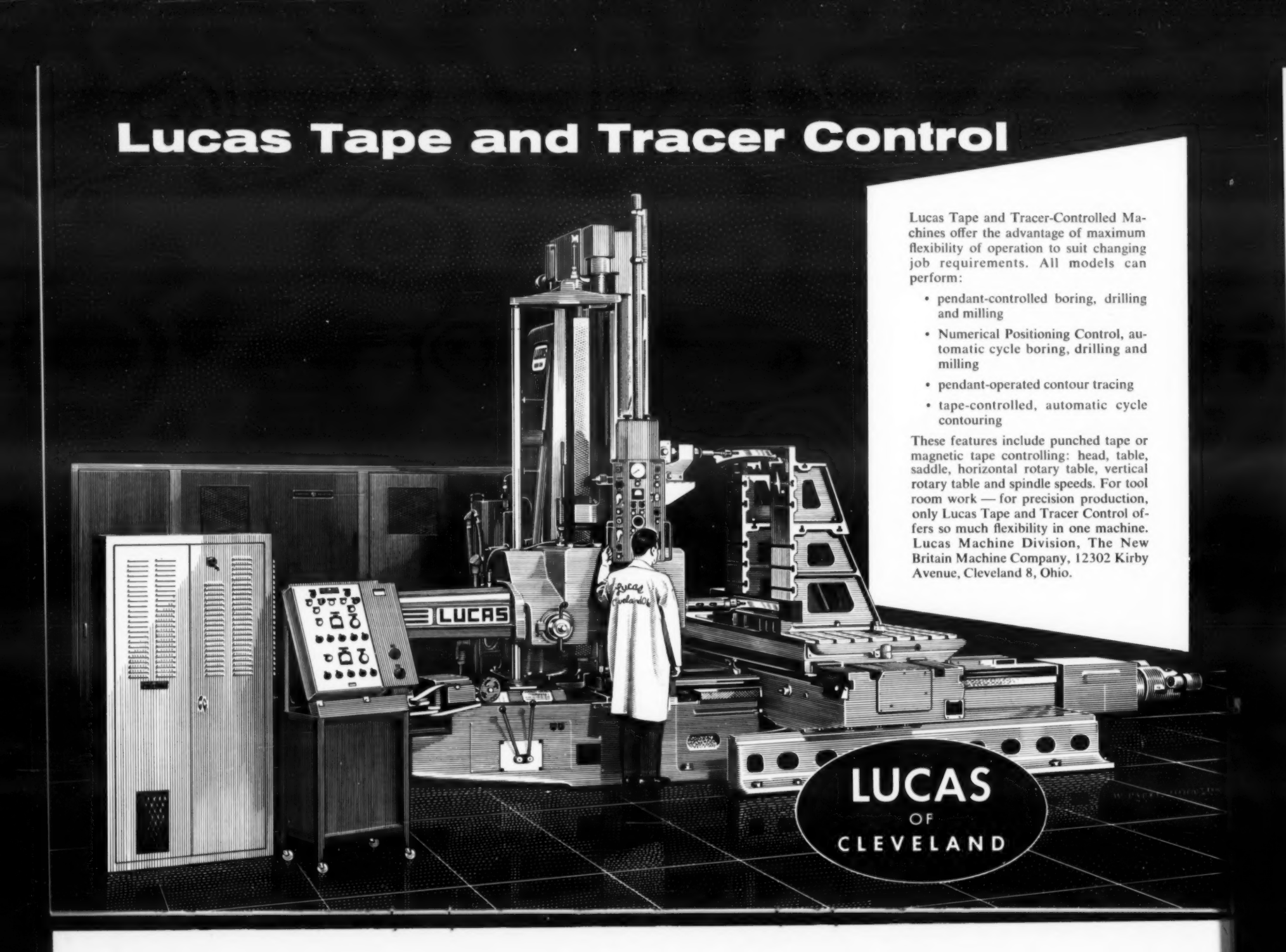
AUTOMOTIVE INTAKE MANIFOLDS are machined in low-production quantities on these special milling and drilling machines. The line index machine (left) rough and finish mills the manifold joint faces; a drilling machine drills and reams location holes; the milling machine (right) mills the water flange and carburetor pad. One operator runs each machine and performs loading, pushbutton cycle, and unloading operations—*Snyder Tool & Engineering Co, 3400 E Lafayette, Detroit 7, Mich*

MORE DATA? Circle 56, inside back cover

CIRCLE 283 READER SERVICE CARD ▶

A New Lucas Lathe
Fully-automatic Tape Control, Tracer Control or both. Infinitely variable speeds and feeds. Automatically-maintained, constant-cutting speeds on changing diameters. Console control from moving operator's platform. *Three* hardened and ground ways. Self-contained Motor Generator Set.
The Lucas Lathe — perfect for your large, lightweight, close tolerance, intricately-shaped problem jobs. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.
LUCAS
OF
CLEVELAND

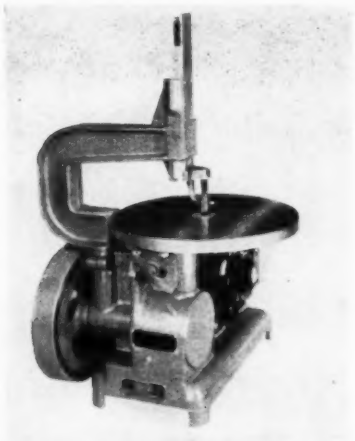
Lucas Tape and Tracer Control



Lucas Tape and Tracer-Controlled Machines offer the advantage of maximum flexibility of operation to suit changing job requirements. All models can perform:

- pendant-controlled boring, drilling and milling
- Numerical Positioning Control, automatic cycle boring, drilling and milling
- pendant-operated contour tracing
- tape-controlled, automatic cycle contouring

These features include punched tape or magnetic tape controlling: head, table, saddle, horizontal rotary table, vertical rotary table and spindle speeds. For tool room work — for precision production, only Lucas Tape and Tracer Control offers so much flexibility in one machine. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.



Contour Sawing and Filing Machine Is Simple to Operate

All sawing, filing and lapping operations of this machine can be performed by an ordinary mechanic. Dies and tools can be shaped so that hand filing and other finishing operations are not required. Machine is available in five types, either bench or pedestal.

Oliver Instrument Co, E Maumee St, Adrian, Mich

MORE DATA? Circle 57, inside back cover

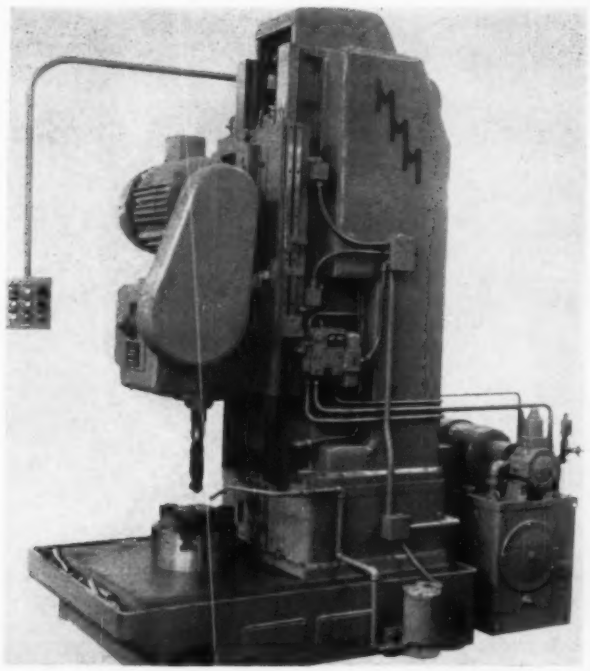
Gear Inspection Recording Unit Checks Tooth Size, Helix Angle

New Red Ring unit automatically checks gears for both size and helix angle accuracy, rejects out-of-tolerance parts, and makes a chart record of the measurements.

It consists of three separate components: gear gaging machine, control panel, and charting device. Items to be inspected are fed into a storage chute in the gear gaging unit. They are automatically advanced one at a time into gaging position where a one-revolution check of size and helix angle accuracy is made by rotating the gear in tight mesh with a rotating upper master gear.

National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich

MORE DATA? Circle 58, inside back cover



M & M Drilling and Boring Machines Feature Automatic Cycling

These vertical machines are available with capacities up to 60 hp and in 15- and 30-in. strokes. Vertical slides are 26 in. wide, 48 in. long and 20½ in. across the ways.

An outstanding feature of these machines is their accommodation of many types of heads, fixtures, indexing tables and bases—adapting the machines to a wide variety of machining operations. The column can be arranged with a series of risers for a wide range of large work.

The 30-in.-stroke model, VS-2630, has an over-all height of 117 in.; the 15-in. stroke model, VS-2615, stands 101½ in. high. Automatic cycle includes rapid traverse down, feed and rapid return, with variations of this automatic cycle available. Machines feature a built-in coolant system and an external hydraulic system that is manifolded to the machine proper.

Motch & Merryweather Machinery Co, 1250 E 222 St, Cleveland 17, Ohio

MORE DATA? Circle 59, inside back cover

Alcoa Bonding Process Joins Aluminum and Stainless Steel

New bonding process, termed pressure bonding, can be used to join aluminum and stainless steel. It also offers possibilities for the use of aluminum in combination with carbon and alloy steels, copper, and other aluminum alloys.

Also under development is the pressure-bonding of relatively low-strength aluminum bearing alloys to high-strength aluminum castings and forgings. A single aluminum part could then provide high strength, while also presenting a surface having excellent bearing characteristics.

Aluminum Company of America, Pittsburgh 19, Penna

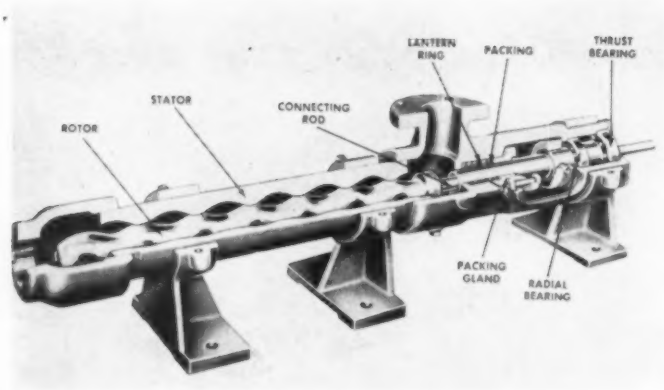
MORE DATA? Circle 60, inside back cover

Clutch-Brake Units Available in Four Mounting Arrangements

Fawick clutch-and-brake press packages are now available in four different mounting arrangements to facilitate use on all presses from 15 to 120 tons. Called Fawick Standardized Press Applications, these packages for modernization of presses to pneumatic control consist of a CB Airflex clutch; CS spring-applied, air-released brake; timing Rotorseal or cam limit switch and standard Rotorseal; high-speed clutch control panel; and a new flywheel or bull gear.

Fawick Corp, Fawick Airflex Div, 9919 Clinton Rd, Cleveland 11, Ohio

MORE DATA? Circle 61, inside back cover



PUMP OPERATION is similar to that of a screw conveyor. In this cutaway view the rotor is moved clockwise, and the flow is from left to right

Progressing Cavity Pump Handles Abrasive Liquids, Has Long Life

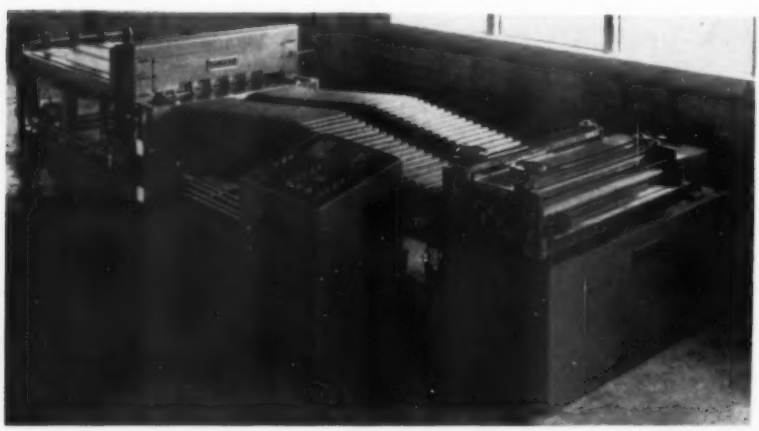
This unusual pump, known as the Moyno—after its French designer, Rene J L Moineau, operates on the progressing cavity principle. The rotor is a true helical screw; the stator has a double internal helical thread. The rotor sweeps the entire stator surface in each complete revolution, with the pockets or voids between the rotor and stator progressing towards the discharge end of the pump. This results in low internal turbulence, positive pressure, and uniform discharge.

One of the pump's first applications was the pumping of an abrasive slurry used to impregnate porous castings. The slurry, consisting of water glass mixed with about 15% red oxide, ground nickel, ground copper, bentonite, and a short-fiber asbestos held in suspension, was highly abrasive and rough on standard pumps. One company ruined a $50 gear pump every eight hours; not one of the many pumps tested lasted more than a week. The first progressing cavity pump tested lasted for 240 hours. The latest models of the Moyno have 30 times the life of their predecessor and are widely used in the automotive industry.

Pressures are easily set and maintained. Pockets between the tool steel rotor and the synthetic rubber stator permit handling of a wide variety of abrasive materials.

Robbins & Myers, Inc, Springfield, Ohio

MORE DATA? Circle 62, inside back cover



Automatic Decoiling and Shearing Lines Convert Coil Stock to Sheets

Designed to convert steel, stainless steel, aluminum and other metal coil stock to sheets, these lines, in their simplest form, consist of a coil reel, straightening roll, hump table, shear and conveyor, with all units wired into a console for electronic measuring and central control of the line.

Lines of this type permit the purchase of space-saving coil stock. Another advantage is the reduced scrap—some plants report having reduced scrap from 15% to 5% of total metal purchased.

Additional equipment that can be supplied includes an edge trimmer, coil racks, coil lifts, scrap choppers, leveling rolls and stackers. Lines are offered in widths up to 6 feet for metal thicknesses up to 10 gage.

Secrest Machine Co, 1507 M St, NW, Washington 5, DC

MORE DATA? Circle 63, inside back cover

Lincoln Electric Announces New High-Tensile Electrodes

Jetweld LH-90 and Jetweld LH-110 are new iron powder, low-hydrogen types designed for making high-strength joints in alloy steels. The former is classed E-9018 and also meets requirements of E-8018-B2; the latter is classed E-11018.

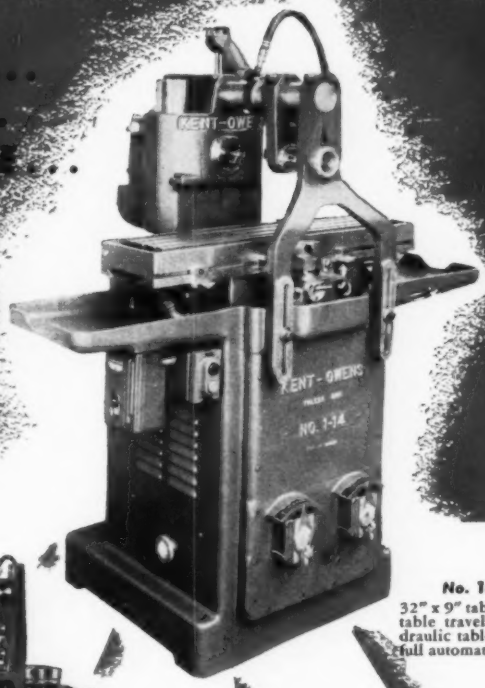
LH-90 is for use on high-temperature, high-pressure piping and on steel fabrication where either the particular alloy content or the high-tensile strength is necessary. LH-110 is intended for use on the new HY-80 and T-1 steels, as well as any other steels that require high-strength joints.

Lincoln Electric Co, Cleveland 17, Ohio

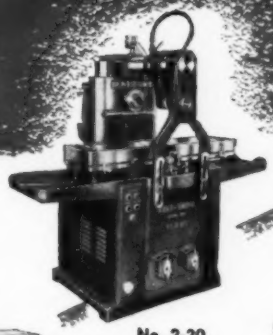
MORE DATA? Circle 64, inside back cover

EXTRA RUGGED... SPEEDY... ACCURATE...

to Bring Down Milling Costs!

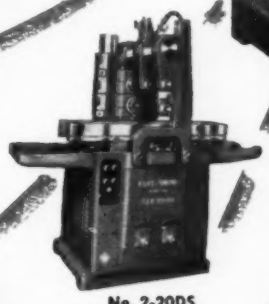


No. 1-14
32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.



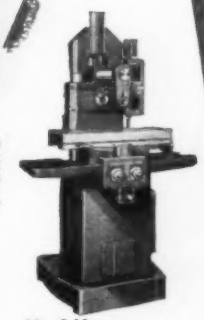
No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.

No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

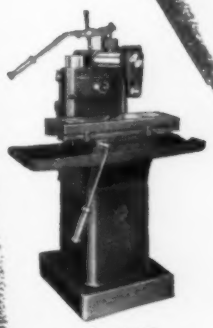


No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel ... 42" x 12" table.

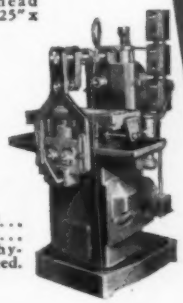
No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.



No. 1-V
Hydraulic vertical head feed ... 5¼" head travel ... 25" x 9" table.



No. 1-M
Hand feed to table and head ...25" x 9" table ... Adjustable head counterbalance.



No. 1-8
8" table travel... 25" x 9" table... automatic hydraulic table feed.

STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout these rugged machines make the difference . . . greater dependability . . . accuracy maintained in meeting tough production schedules. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #754 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, O.

KENT-OWENS
for milling machines

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TORONTO, ONT.
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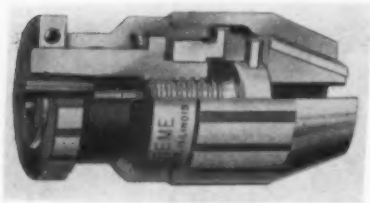
WINDSOR, ONT.
F. F. Barber Mach'y Comp.



KEYLESS INDUSTRIAL CHUCK, Precisionist, has jaws of chrome molybdenum alloy steels, runout guaranteed to be minimum. Unit is currently available in 1/2-in. capacity in Tapers No. 2, 6, and 33, and in 5/8-in. capacity with No. 6 taper; 1/4 and 3/8-in. capacity units of similar ball bearing construction will be available shortly—*Supreme Products Corp, 2222 S Calumet Ave, Chicago 16, Ill*

MORE DATA? Circle 65, inside back cover

Portable Plastic Molder Features Quick Setup, Rapid Production

The Unex Jet portable plastic molder is reported to provide an ideal method for testing experimental parts or new designs prior to ordering production dies.

Die sets can be changed in less than a minute. Interchangeable injection cylinders permit rapid change of plastic materials and colors. Machine has a maximum shot capacity of approximately one-half ounce or 3/4 cu in. A hopper receives the charge of granular pellets. Operation of the injection lever actuates a toggle linkage that exerts a molding pressure up to 20,000 psi.

Molder can handle all thermoplastics including nylon. Normal production is 1 to 3 cycles per minute. Normal mold space is 3x4x2 1/4 in. deep, but special sizes are available. Unit weighs under 100 lb and measures 30 in. high, 18 in. long and 8 in. wide.

Unex Laboratories, Hathorne, Mass

MORE DATA? Circle 66, inside back cover

Lindgren Universal Chuck Holds Cylinder Grinding Wheels

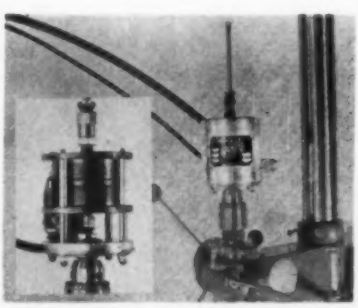
Designed to facilitate the interchange of cylindrical grinding wheels on surface grinders, the Universal chuck automatically centers the grinding wheel with the spindle as the jaws of the chuck tighten against the grinding wheel, which is always in balance. This feature is reported to eliminate off-center chatter and off-center vibration in the spindle.

Jaws spaced around the grinding wheel are tightened by turning a simple chuck key. Equal pressure is applied by each jaw, eliminating the danger of breaking the wheel.

The chuck is available in sizes to accommodate all standard wheels from 6 in. to 20 in. diameter on surface grinders or any machine using a cylinder wheel.

Lindgren & Sons Machine Inc, Chicopee Row, Groton, Mass

MORE DATA? Circle 67, inside back cover



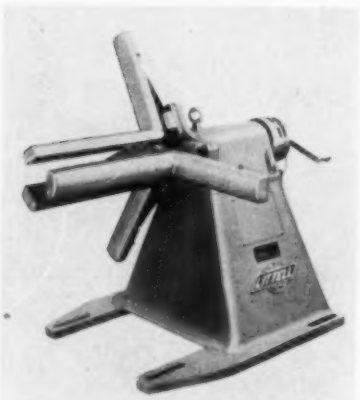
Electro-Magetic Disintegrator Has Lower Electrode Consumption

This disintegrator head offers more controlled drive and lift power, permitting the use of larger electrodes or deeper hole drilling. The sensitive vibration control is designed to allow the use of very small diameter electrodes, 0.008 to 0.010 in. OD.

Reportedly, the disintegrator head will operate while completely submerged under water. The spindle lift and spindle drive are rectified and will not weld or stick. Electrode consumption has been reduced.

Jiffy Disintegrators, Inc, 1503 East 11 Mile Rd, Royal Oak, Mich

MORE DATA? Circle 68, inside back cover



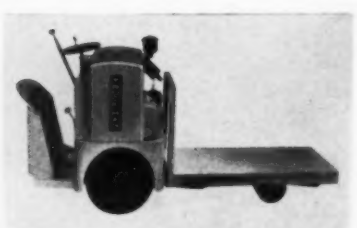
Automatic Centering Reels Hold Copper, Brass, Bronze, Tin Plate

New line of automatic centering 3-arm reels is designed for the normally smaller ID's of copper, brass, bronze and tin plate coil stock. The reels hold coils up to 4000 lb, of 45-in.-max OD and 18-in.-max width.

An adjustable spindle drag provides controlled uncoiling. Full braking is automatically applied upon stoppage of the using machine, positively preventing excessive coil unwinding. Both plain and motor driven reels are available.

F J Littell Machine Co, 4101 N Ravenswood Ave, Chicago 13, Ill

MORE DATA? Circle 69, inside back cover



Platform Lift Truck Handles Skids or Racks up to 7500 lb

Model 75 platform lift truck features power steering, electric starter, and a No-Spin differential that delivers constant power to both drive wheels from the gasoline or LPG engine.

Standard platform is 28 in. wide by 60 in. long, but wider platforms are available and length may vary

CIRCLE 286 READER SERVICE CARD ▶

GUARANTEED

. . . the most precise chuck ever produced

THE NEW *Supreme* KEYLESS Precisionist®

Made by **Supreme** in **Chicago, U.S.A.,** for the most exacting production line and toolroom use.

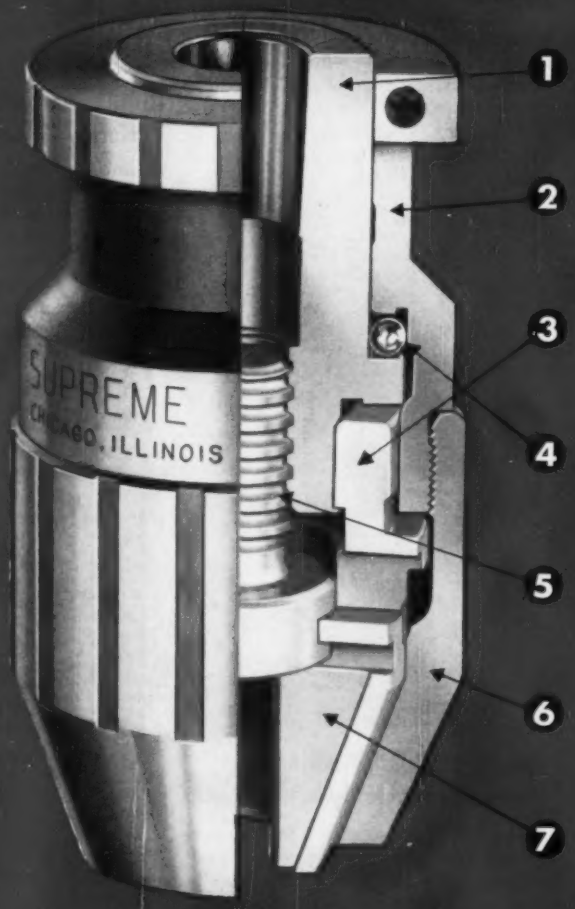
- Exclusive **tool steel jaws**
- Precision-quality **ball** bearings
- Unsurpassed **gripping** power
- Unmatched **accuracy**
- Trouble-free **keyless** action
- Controlled **uniform** materials
- Available now: ½" capacity in Tapers #2, 6, 33 . . . ⅝" capacity in #6 Taper
- Available soon . . . ¼" and ⅜" capacities

1 **CHUCK BODY**—Ground to extra precision limits. Taper bore air gage checked.

2 **GUIDE HOLDER**—Internal diameters and shoulder ground in one setting. External shoulders precisely located.

3 **JAW GUIDE**—Ground to perfect matching fit.

4 **THRUST RACE BALL**—Hardened chrome steel.

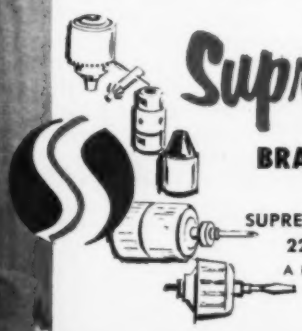


5 **SCREW**—Carbo-nitrided steel.

6 **SLEEVE**—Carbo-nitrided steel, extra high surface hardness. Ground to gage makers' tolerances.

7 **JAW**—Tool steel material, hardened throughout.

Supreme Industrial Distributors stock them to serve you.



Supreme BRAND Chucks

SUPREME PRODUCTS CORPORATION
2222 S. Calumet, Chicago 16
A DIV. OF A•S•R PRODUCTS CORP.

from 54 in. on up. Truck has a hydraulic power platform lift of 9 in. Lift is vertical for close placement of skids.

Designed to handle skids or racks, the truck has a capacity of 7500 lb. Cutside turning radius of only 94 in. permits operation in 66-in.-wide intersecting aisles when truck is equipped with a standard 28x60-in. platform. Other features include two speeds forward and reverse, 5 and 10 mph; 15% gradeability; and dead-man foot brake.

Truck-Man Lift Trucks, 507 Liberty St, Jackson, Mich

MORE DATA? Circle 70, inside back cover

Sensitive Drilling Machines Feature Variable Spindle Speeds

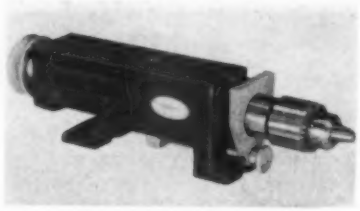
Lennox-Demco sensitive drilling machines are available in one-, two-, three-, four- and six-spindle models. The multi-spline spindle is of such design that it is impossible for it to drop of its own weight when the operator is through drilling; actually, there is a constant upward pressure, eliminating all vertical lost motion. The spindle also automatically compensates for whatever wear takes place.

Capacity of current models is 1 in. in cast iron and ⅝ in. in mild steel. Speed ranges are: 110 to 2100 with an 1800-rpm motor and back gearing; 210 to 2100 with an 1800-900-rpm two-speed motor; and 420 to 2100 rpm with an 1800-rpm motor. Correspondingly slower speeds are available when using a 1200-rpm or a 1200-600-rpm motor.

General specifications include 12-in. center distance, 7-in. spindle travel and 17-in. table travel.

Lennox Tool & Machine Builders, Lima, Ohio

MORE DATA? Circle 71, inside back cover



Drillhead Mounts in Any Position, Performs Variety of Operations

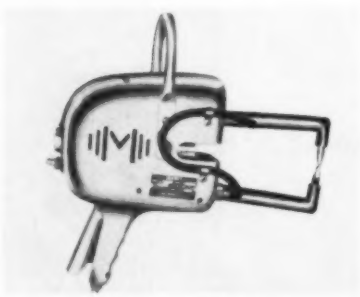
Slightly larger than a carton of cigarettes, the Model 22A drillhead is capable of many machining operations on the softer metals. It will drill, tap, ream, spot face, countersink and counterbore. Its small size is advantageous in close-quarter work on light-gage steel, nonferrous metals, wood, plastics and rubber.

The unit can be mounted in any position, singly or in groups. Feed and retract strokes are powered by a built-in air cylinder with a maximum 2-in. stroke. Stroke is adjustable throughout full range. Drilling capacity is from a No. 80 drill to a 3/16-in.-dia drill in mild steel. Base casting has a keyway.

Maximum recommended spindle speed is 8000 rpm; an optional high speed spindle assembly for speeds to 12,000 rpm is available. Basic model, which does not include pulley, electric motor or chuck, is priced at $95.

Bellows Co, Akron 9, Ohio

MORE DATA? Circle 72, inside back cover



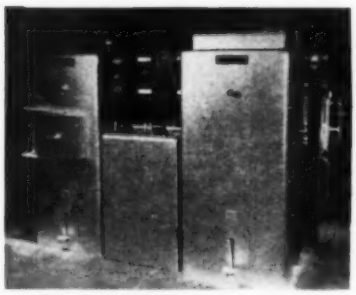
Spot Welder Is Designed for Portable or Pedestal Operation

Outstanding features of this spot welder include an automatic electronic timer and contactor to give consistent welds; welding capacity up to 3/16-in. combined thickness on a wide variety of metals; and a linkage device that permits variable tip pressure of zero to 1000 lb. Welder uses standard tips and can be used on steel, most aluminum alloys, brass, cadmium plated and galvanized steel, and other related metals.

Unit is available in air-cooled and water-cooled models; both 8⅝ in. high, 18½ in. long, and weighing 28 lb.

Merit Co of Chicago, 2124 W Chicago Ave, Chicago, Ill

MORE DATA? Circle 73, inside back cover



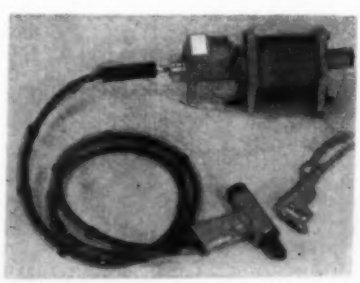
Waltz Three-Section Furnace Heat Treats Small Tools

This three-section furnace provides complete heat treating facilities for small tools. The wide temperature range and accurate controls enable the furnace to handle every type of high-speed steel including the cobalt type.

Furnace is made up of three separate units, a preheat furnace, a drawing furnace, an atmosphere generator, and two quench tanks, one for oil and one for water. Unit can be bought complete or as separate sections. Furnaces can be had in either 12x12x20-in. or 8x6x14-in. size.

Waltz Furnace Co, Dept E, 1901 Symmes St, Cincinnati 6, Ohio

MORE DATA? Circle 74, inside back cover

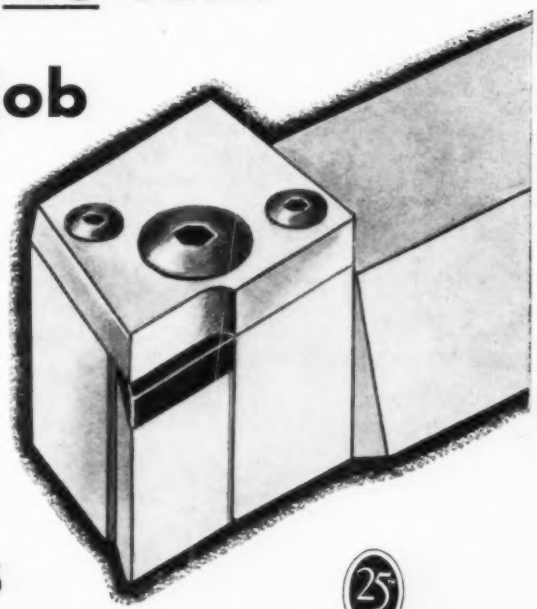


Lightweight Riveting Tools Set Small Rivets

A powered riveter and a hand riveting tool have been added to company's line of riveting equipment. The powered tool, designated the PRG Hydraulic Gun, consists of an air-hydraulic intensifier, a portable riveting gun, and connecting hoses. The gun weighs only slightly over

Nobody can cut steel better than you can!

Any cutting job is easier when you rely on V-R carbides



COMPLETE LINE OF CARBIDE, CERAMIC AND TANTUNG® CAST ALLOY CUTTING TOOLS.

Engineered by production men to solve production problems

It's the carbide that cuts . . . and solving cutting problems becomes a simple matter of engineering the V-R carbide for the job. V-R Production Engineers have worked with thousands of cutting problems and developed carbides for maximum cutting efficiency in practically any application.

Put this fund of cutting know-how to work solving your problems. Just give us the details on the operations performed, material specs, speeds and feeds desired, dimensional tolerances, desired surface finish and all other pertinent data — it's dollars to doughnuts we've already engineered the V-R carbide for the job. V-R Engineers will work with you to fit the right carbide to the job and reduce cutting costs.

Send for new Catalog VR-58 for complete details

V-R® Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

C-703

898 Market Street • Waukegan, Illinois

2 lb, yet will pull Monel rivets up to 3/16 in. in diameter. The intensifier operates at pressures of 70 to 100 psi from shop air outlets, and boosts the pressure to 2700 psi at the hydraulic end. Rivet can be placed either in the gun or in the work, and the cycle is completed by a light squeeze of the spring trigger.

The hand riveter, the PRP Model B, just slightly larger than household pliers, can set aluminum rivets of 3/32, ⅛ or 5/32 in. diameter, and Monel or steel rivets up to ⅛ in. in diameter.

Both can be used for setting rivets in standard, overhead or blind applications, and both can set break-stem or break-head Pop rivets.

Pop Rivet Div, United Shoe Machinery Corp, West Medway, Mass

MORE DATA? Circle 75, inside back cover

Air Reduction Introduces Three DC Arc Welding Machines

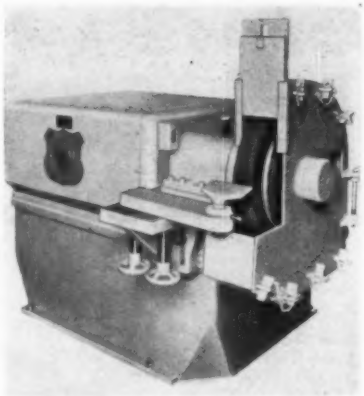
Latest additions to the company's line of welding machines, these machines include an Aircomatic Fillerarc welder designed especially for consumable-electrode, gas-shielded welding processes; two models of the Hornet 36B motor generators for both metal-arc and inert-arc welding; and two models of the Yellow Jacket water-cooled engine driven welder.

The Aircomatic Fillerarc welder is designed to maintain equal burn-off rate and wire-feed. The rising volt-ampere curve reacts instantaneously to all wire-feed speed changes to maintain constant arc length. Current rating is 450 amps continuous. Machine is 28¾ in. high, 20⅝ in. wide and 34⅝ in. long.

The Hornet motor generators are available in 300- and 400-amp models. The Yellow Jackets are built in 300- and 400-amp sizes and are particularly suited for field work.

Air Reduction Sales Co, 150 E 42 St, New York 17, NY

MORE DATA? Circle 76, inside back cover



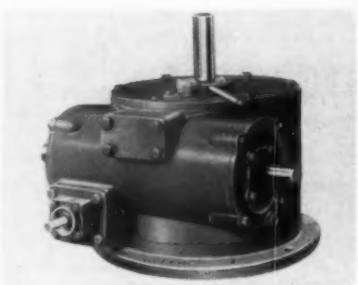
Constant-Cutting-Speed Grinder Is Hydraulically Driven

Model 61HVS snagging grinder does away with gears, belts and adjustable pulley drives. The hydraulic drive is operated by a TEFC motor working a hydraulic pump. This system provides constant horsepower, constant peripheral speed and automatic wheel wear adjustment.

An automatic speed changer adjusts the wheel speed to the wheel diameter each time the grinder stops. Other features include a magnetic pushbutton starter, shaft lock, wheel guard, steel flanges for high-speed wheels, cast iron flanges for vitrified wheels. Machine is available in 220, 440 or 550-v models for 2- or 3-phase, 60-cycle alternating current.

United States Electrical Tool Co, Llewellyn St, Cincinnati 23, Ohio

MORE DATA? Circle 77, inside back cover



Cam-Operated Indexing Unit Works With Shaft Vertical or Horizontal

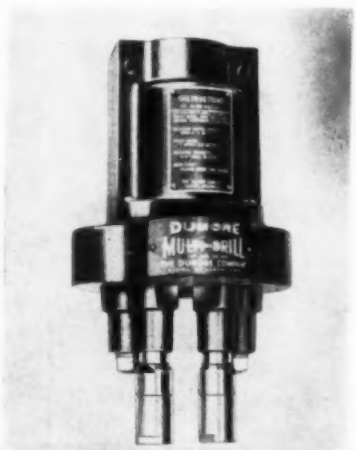
Designed for precision positioning between automatic production stations, this cam-operated indexing unit provides 8, 12, 16 or 20 indexes during one turret cycle. Each revolution of the cam shaft rotates the dial plate or index shaft through one index. A major portion of the rotation is used for dwell or work time, the balance for positioning to the next index. Tables, with standard and special drives, including timers, can also be furnished to meet a particular requirement.

The unit has a higher torque rating, and will operate with the shaft vertical or horizontal, increasing its versatility.

A variety of cams are available to give a choice of ratios between work and dwell time. Work time can be either ¼, 1/3 or ¾ of each index cycle. Unit can be supplied with or without an integral 20:1 or 40:1 speed reducer on the input shaft. Cam shaft extensions provide means for operating production drives or auxiliary drives.

Standard Tool & Mfg Co, 237 Laurel Ave, Kearny, NJ

MORE DATA? Circle 78, inside back cover



Attachment Has Drilling Capacity Of ¼ in. in Steel

Multi-spindle drilling and tapping attachment, designed for use on the Dumore Series 24, 26 and 28 automatic drill units, is available in two-, three-, and four-spindle models.

Each spindle has a drilling capacity of ¼ in. in steel. Spindles rotate from a fixed point and can be adjusted to reach a 3⅞-in.-max bolt circle while the minimum center distance is ⅞ in. Standard gear ratio is 2.2 to 1 with a maximum recommended spindle speed of 4000 rpm.

Device measures only 9 3/32 in. high and 4⅞ in. wide, and weighs slightly less than 5 lb. No guide rods or outboard supports are required when the attachment is used with the Dumore drilling units.

Dumore Co, 1300 17th St, Racine, Wis

MORE DATA? Circle 79, inside back cover

LEADERSHIP at work

Change of face for angle iron — Taft-Peirce Mfg. Co., Woonsocket, R.I., face-mills sides of angle irons with a Kearney & Trecker—Milwaukee Model CH 10hp No. 3 vertical mill. With hand on Mono-Lever, operator Leo Casavant easily controls table feed and rapid traverse. For more effective climb milling, Taft-Peirce's CH is equipped with backlash eliminator, offering greater milling accuracy, longer screw life.

KEARNEY & TRECKER
MILWAUKEE

6786 W. NATIONAL AVE., MILWAUKEE 14, WIS.

Kearney & Trecker's man on the job . . .

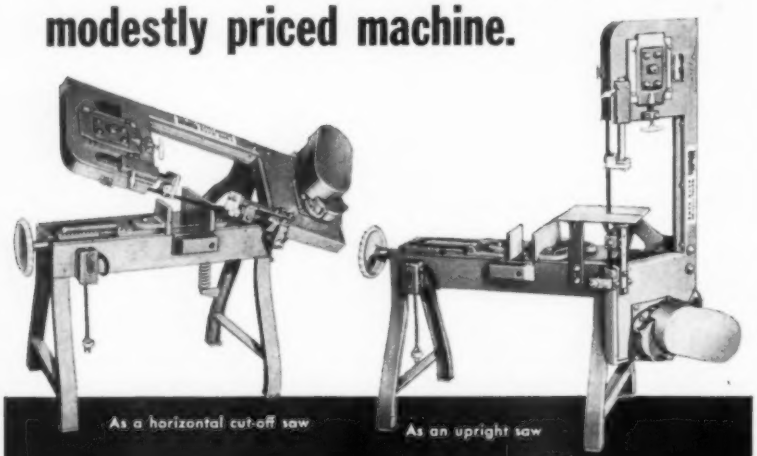
Henry Stewart of Stedfast & Roulston, Boston, worked with Taft-Peirce executives on CH machine selection. *For expert milling counsel, call the K&T man near you. And remember to ask him, or write direct, for free comprehensive catalog.*

Kearney & Trecker staff photo by Ron Johnson

NEWS FROM WELLS MFG. CORP.
HORIZONTAL BAND SAW PIONEERS

A CONVERTIBLE BAND SAW

that will give you the capacity you've been looking for in a compact, modestly priced machine.



The new WELLS MODEL 58-B
Double Duty — Double Value Band Saw

• Here's the all new metal saw you have been asking for . . . Wells Model 58-B . . . designed and built to give you double duty—double value. It's a compact, rugged, well guarded, extremely versatile unit at an economical price.

As a horizontal cut-off saw, Model 58-B features quick action vise (swivels to 45 degrees), automatic shut-off and adjustable guides.

For vertical use, just swing head into upright position and install work table.

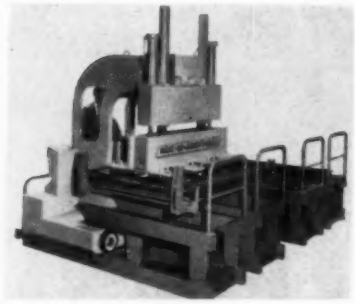
To give it complete mobility, a wheel-handle unit is available as optional equipment.

If you cut metal in the shop or on construction jobs, check the profit building advantages of Wells Model 58-B. Call your nearby Wellsaw Dealer or write for descriptive literature.

SPECIFICATIONS

Capacity:	
Rectangular	6" x 10"
Round	6" Diameter
45° Angle	5" x 5"
Speeds, f.p.m.	76—141—268
Blade Size	½" x .025 x 93½"
Motor	½ H.P.
Width of Bed	8½"
Floor to top of Bed	22¼"
Floor Space	19" x 47"
Height (Frame Vertical)	52"
Height (Frame Horizontal)	37"
Vertical Capacity:	
Work Table	7⅝" x 10"
Throat Height	9½"
Throat Depth	7¾"
Net Weight (Approx.)	220 lbs.

Wells SAWS
Wellsaw ®
The Pioneers of Horizontal
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
303 ROOSEVELT ROAD, THREE RIVERS, MICH.



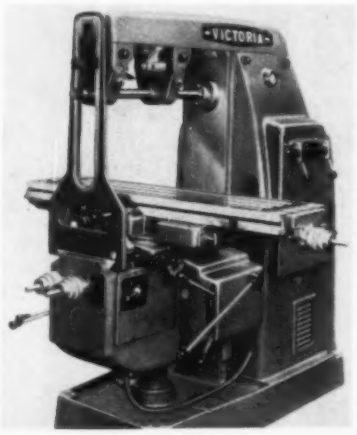
Vacuum Plate Lifter and Feeder Lifts and Moves Five Tons

Combination vacuum plate lifter and feeder lifts and moves single or multiple plate loads of 2000 to 10,000 lb by vacuum alone. A single switch turns on two vacuum pumps, which evacuate the safety tank, and the vacuum is transmitted to the eight 20-in.-square waffle-faced vacuum cups.

The unit can be supplied with extension arms (not illustrated) making it possible to lift heavy plates 10 ft wide by 40 ft long, weighing 10,000 lb or more. The entire unit rides on rails and can be made semi-automatic or fully automatic with remote controls.

Vac-U-Maton Div, F J Littell Machine Co, Dept 3-C, 4127 N Ravenswood Ave, Chcago 13, Ill

MORE DATA? Circle 80, inside back cover



British Milling Machine Has Spindle Speeds of 30-1500 rpm

The Victoria U2 Rapidmil has two speed ranges covering from 30 to 1500 rpm, and feeds from 0.65 to 21.5 ipm. Other features include back-

(Continued on page 142)

Make Certain the BEARINGS you buy are in the MAKERS' SEALED BOXES

And what is so important about a manufacturer's box? Just this; surplus bearings or shelf worn bearings are usually shipped in one large package. Or, if individually wrapped, in plain boxes—often without any identification, usually of ancient "vintage". . . . and bearings do not improve with age.

Bearings from our stocks are always sold just as they arrive from the manufacturer—fresh, fully protected and guaranteed to be first quality by the maker and ourselves.

We are *authorized* distributors for all of the many lines of bearings and accessories we sell. Our engineers can recommend the best bearing for your application.

Call the branch nearest you.

Providing bearing service in the North ➤ **BEARINGS, INC.**

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Belanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and

in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville

Up to 625 hp

NOW! THE COUPLING WITH THE 4-WAY FLEX!

DODGE Para-flex

FLEXIBLE CUSHION COUPLING

THE NEW IDEA IN FLEXIBLE COUPLINGS... WITH A FLEXING BODY THAT AUTOMATICALLY COMPENSATES FOR ALL COMBINATIONS OF MISALIGNMENT AND END FLOAT... AND CUSHIONS SHOCK LOADS!

THIS Coupling "swallows up" misalignment! Its ability to handle multiple displacement is exceeded only in a universal joint. It outperforms the most complex coupling mechanisms—yet it operates with the simplicity—*and the dependability*—of a modern tire!

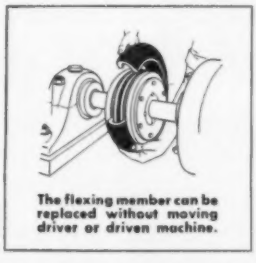
The technological advances that contribute to the miracle of today's truck tires, which are engineered to carry tremendous loads at high speeds and stand terrific shock, have made this new type of coupling possible.

The heart of Para-flex is a tire with synthetic tension members bonded together in rubber. It is pliant. It "fits itself" to changing shaft conditions—angular, parallel, end-float, *or any combination of all three!* Depending upon the size of coupling and duration of shaft misplacement, it handles angular misalignment up to 4°, parallel up to 1/8" and end-float up to 5/16".

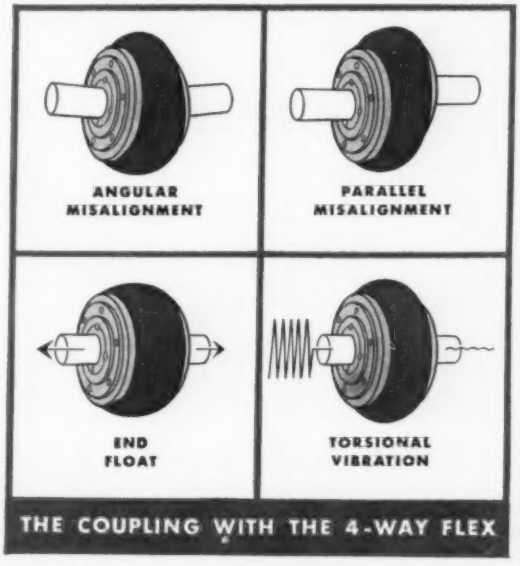
It cushions the stresses of shock loads to a remarkable degree. And it tends to absorb torsional vibration—reducing noise and protecting machinery from vibration's destructive forces.

There is no metal-to-metal contact between shafts. They are insulated. No lubrication is required.

Para-flex takes a minimum of space on the shaft. Mounting is simplified through the use of standard Taper-Lock bushings—no reboring, no machining. Safety is promoted by flush design; there are no protruding parts. And since the flexible member is molded with a transverse split, it can be replaced *without moving either the driver or driven machine!*



The flexing member can be replaced without moving driver or driven machine.



THE COUPLING WITH THE 4-WAY FLEX

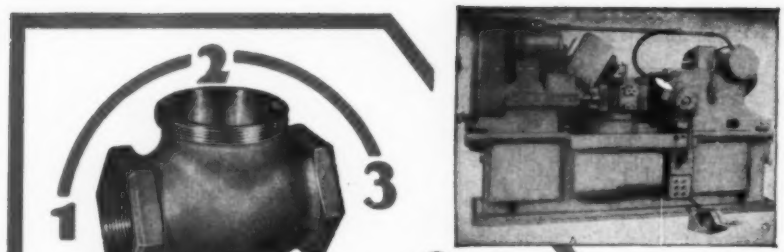
Para-flex Couplings are stocked by Dodge Distributors in popular transmission sizes. They are available from factory stock in capacities up to 825 hp at 1200 rpm. Call your distributor for early delivery to *make your own test.* You'll witness something revolutionary!

DODGE MANUFACTURING CORPORATION, 100 Union Street, Mishawaka, Indiana

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods in the mechanical transmission of power. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer." Or write us.



GOSS & DeLEEUW

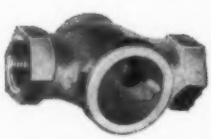
AUTOMATIC CHUCKING MACHINES

perform one to three operations in sequence or simultaneously . . .

TO CUT PRODUCTION COSTS...

More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & DeLeeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.

Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.



Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS *and* DE LEEUW

MACHINE COMPANY, *KENSINGTON, CONN., U.S.A.*

lash eliminator, mechanical overloads, one-shot lubrication, power and rapid traverses in all directions, nickel-chrome hardened and ground gears. Extra-heavy spindle carries a flywheel bullgear and runs on tapered roller bearings.

Imported by Bentley Industrial Corp, 41 E 42 St, New York, NY

MORE DATA? Circle 81, inside back cover

Delta 16-20-in. radial saw has improved features which include a precision index plunger that permits operator to make quick, positive settings at the most-used angles, and a clamping device that assures positive settings at all other angles. Two new accessories are also available—a safety return and a chain feed control.

Rockwell Manufacturing Co, Delta Power Tool Div, 487 N Lexington Ave, Pittsburgh 8, Penna

MORE DATA? Circle 82, inside back cover

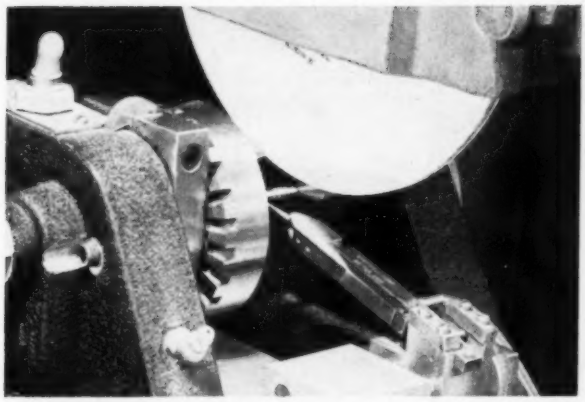
Way protectors, available for long, wide tool beds, have aluminum bridges built into neoprene-base materials. They can open to 90 ft on both sides of the column and close to 24 in. Protection may be applied in both horizontal and vertical positions.

A&A Mfg Co, 712 S 12th St, Milwaukee, Wis

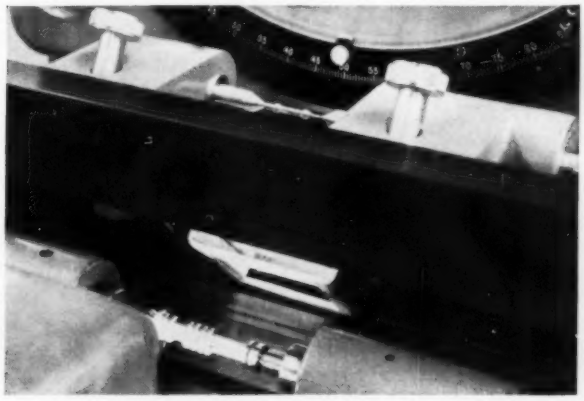
MORE DATA? Circle 83, inside back cover

Two-flute gun drills, Starbore Center-Cut line, have an enlarged coolant hole in the molded carbide tip that is said to provide a 100% increase in coolant flow to the two

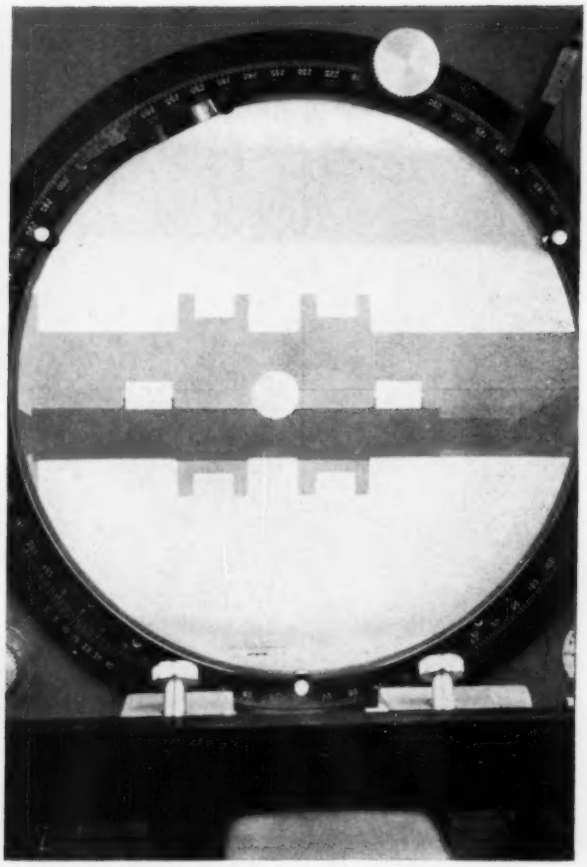
"MM-M, doesn't that smell good! I put some coffee in with my cutting oil."



1. Piston lands on hydraulic control valves are trimmed on a surface grinder fitted with motorized centers.



2. After trimming, piston and sleeve are mounted on worktable of Kodak Contour Projector for simultaneous projection by two light sources to gage amount of stock removal.



3. Overlap of piston and sleeve images is indicated by black area; overlap can be measured quickly by traverse of one part and observation of dial indicator.

How to do a 7½-hour gaging job in half an hour

How would you solve a gaging problem like this one?

In developing hydraulic control valves, engineers at a major firm producing aircraft components worked out a neat method of trimming piston lands in relation to ports in their mating sleeves.

But meeting the required .0002" overlap between piston lands and sleeve ports meant using several different gages to determine the amount of stock which had to be trimmed. Result: *7½ hours to trim each valve.*

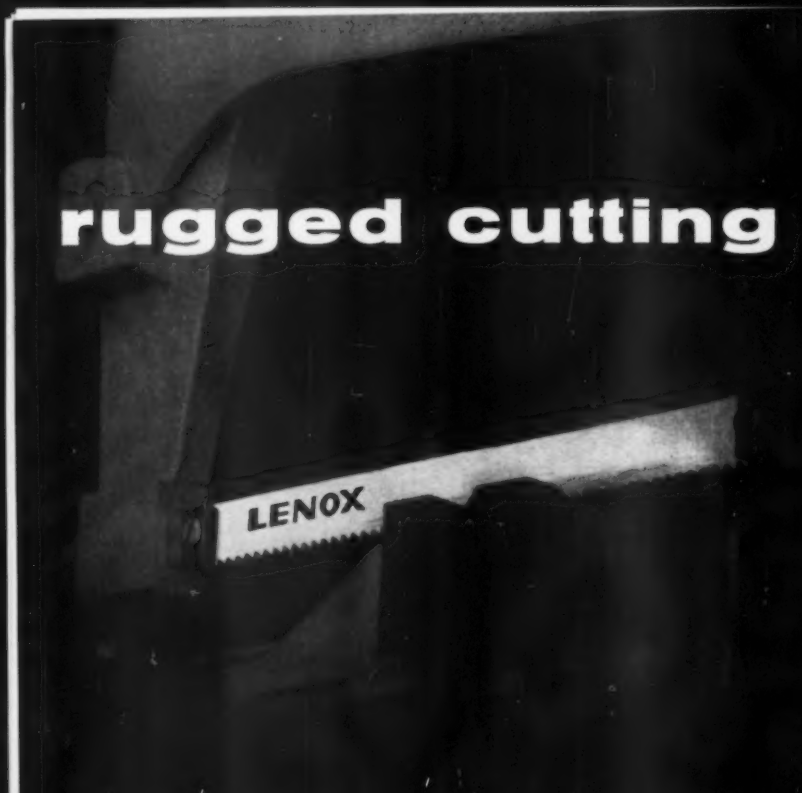
To solve the problem, quality control engineers now use a Kodak Contour Projector with two light sources and two filters, one red and one green. This system projects a superimposed image of the piston on the sleeve. Where an overlap occurs, the red and green images combine into a black image. The width of this black overlap gives the amount of trim required. Result: *just ½ hour needed—7 hours saved on each valve!*

Maybe you've come up against a gaging problem that's eating up time and money in large quantities. To learn how you can solve it by optical gaging, send for the booklet "Kodak Contour Projectors." Write to:

Apparatus and Optical Division
EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak



rugged cutting

...WITH LENOX MO-SPEED® POWER HACK SAW BLADES

Here is a power hack saw blade that can take it! Power-packed steel, tough-wearing teeth, and straight-cutting performance gives you increased production rates with minute tolerances.

Made of the finest high-speed steel, the LENOX Mo-Speed bites into the toughest materials, takes full-rounded chips, eats through hard spots. You'll spend less time changing blades, get straighter cuts, and boost cutting records when you switch to Mo-Speed.

There are three types of LENOX power blades designed to fit your particular cutting needs. Call or write today for full information.

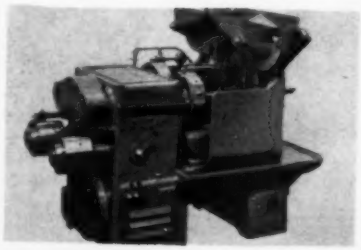
LENOX
THE TOOLS IN THE PLAID BOX

AMERICAN SAW & MFG. COMPANY
SPRINGFIELD, MASSACHUSETTS • U. S. A.

cutting edges, thus improving surface finish of produced holes as well as prolonging tool life between grinds.

Star Cutter Co, 34500 Grand River Ave, PO Box 376, Farmington, Mich

MORE DATA? Circle 84, inside back cover



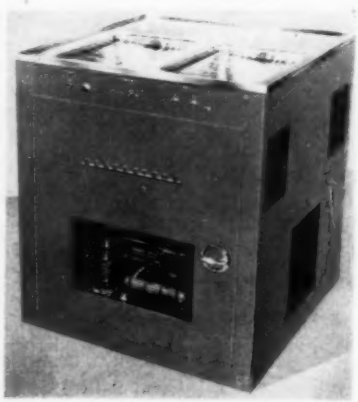
Two-Spindle Automatic Nut Tapper Available in Four Models

The Nutap, made in West Germany, is currently furnished in four models ranging from No 5 to ¼ in.; ¼ to 7/16 in.; 3/8 to 3/4 in.; and 5/8 to 1¼ in. Larger model, 1¼ to 2 in., will be available in the near future.

Features include positive pitch cams, gripping devices for cylindrical nuts, safety devices to prevent tap breakage.

Distributed by Erich Lange Engineering, 1137 Cranford Ave, Cleveland 7, Ohio

MORE DATA? Circle 85, inside back cover



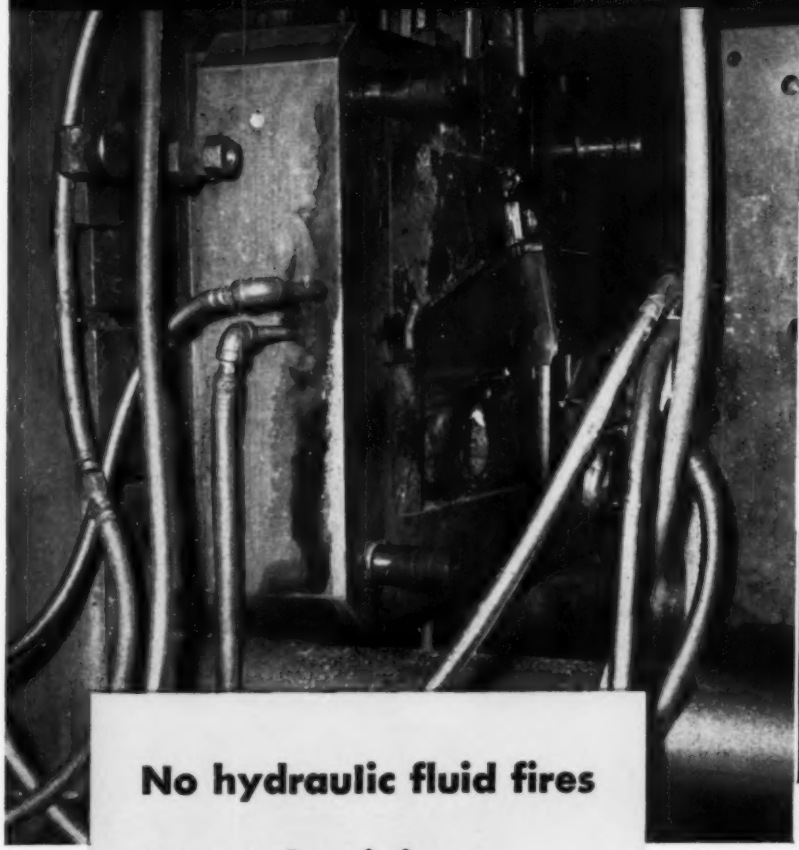
Ultrasonic Unit Cleans and Rinses Parts and Assemblies

Model GW-6, latest in company's line of ultrasonic cleaning units, has two 10x14x10-in.-deep stainless steel tanks for ultrasonic cleaning and rinsing. The solution in each tank is continuously circulated and filtered to remove all particles of 2-5 micron

(Continued on page 148)

◀ CIRCLE 295 READER SERVICE CARD

"For 3 solid years—



Irus Fluid's distinctive yellow color makes it easy to spot and trace leaks.

Complexity of lines (left) and pots of molten metals (above) represent the type of fire hazards requiring Shell Irus Fluid 902.

No hydraulic fluid fires

No worker injury

No equipment damage —since we switched over to SHELL IRUS FLUID 902"

says Ernie Ike, Plant Superintendent
Western Die Casting Co., Emeryville, Calif.

According to Mr. Ike, these results are directly due to the switch-over in 1955 from conventional hydraulic fluids to Shell Irus Fluid 902.

Irus® Fluid 902 is a special combination of petroleum oils mixed with water and emulsifying agents. Its fire resistance is achieved through the relatively high water content. Irus snuffs out fire, *under plant conditions.*

Another important advantage of Irus Fluid 902 is its low cost. Plant operators now using Irus have discovered that Irus Fluid costs up to one-third less than other fire-resistant fluids . . . yet is comparable in performance in every practical respect.

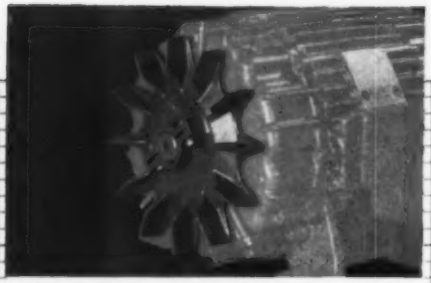
If the hydraulic equipment in your plant is exposed to fire hazards, let a Shell Industrial Representative show you the advantages of Irus Fluid 902. Write Shell Oil Company, 50 West 50th St., New York 20, N. Y. or 100 Bush St., San Francisco 6, Calif.

SHELL IRUS FLUID 902

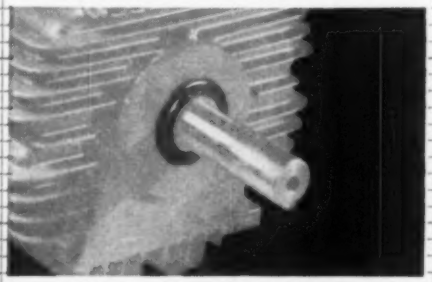
a low-cost, fire-resistant hydraulic fluid

SHELL

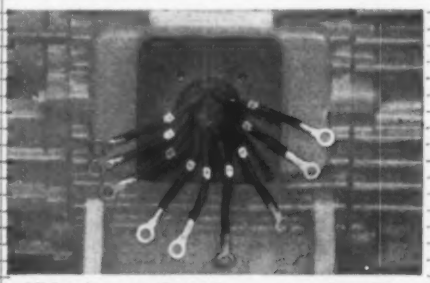
ELLIOTT C-W SEALEDPOWER



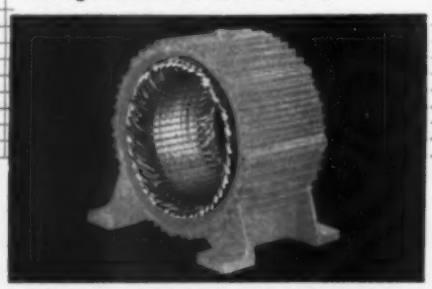
Sturdy external fan has a split hub both keyed to the shaft. No chance of slippage or loosening.



A slinger on the motor shaft effectively guards against the entrance of moisture and foreign material. Slinger is recessed into the bearing bracket to provide a long, labyrinth-type seal.



All leads pass through a grommet as they are brought out of the motor frame. When conduit box is mounted in position, the grommet is tightly compressed, providing a snug seal at this vulnerable area.



Precision-built stators are individually surge tested, and impregnated with siliconized varnish, for improved heat stability and heat resistance.

. . . designed for the dirty jobs

Elliott C-W Sealedpower motors can safely be installed outdoors, or in dusty, moist and corrosive atmospheres. Internal parts are thoroughly protected from the environment. Many users have standardized on this type of motor for all applications because they find that the total cost—first cost plus maintenance—is less for totally-enclosed motors than for conventional enclosures!

This popular, dependable group of motors is part of the Elliott C-W line, which includes also standard Dripproof-protected and Explosion-proof designs.

The original C-W fin-cooled, self-cleaning design which provides more cooling area—no internal passages to clog.

ELLIOTT Company

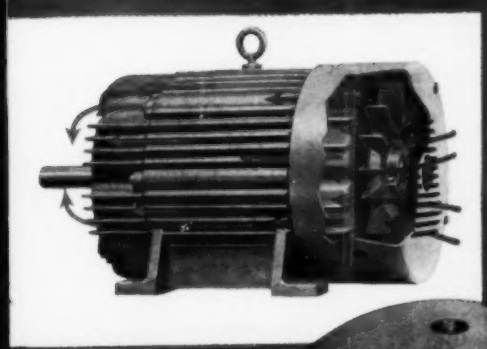
CROCKER-WHEELER PLANT, Jeannette, Pennsylvania

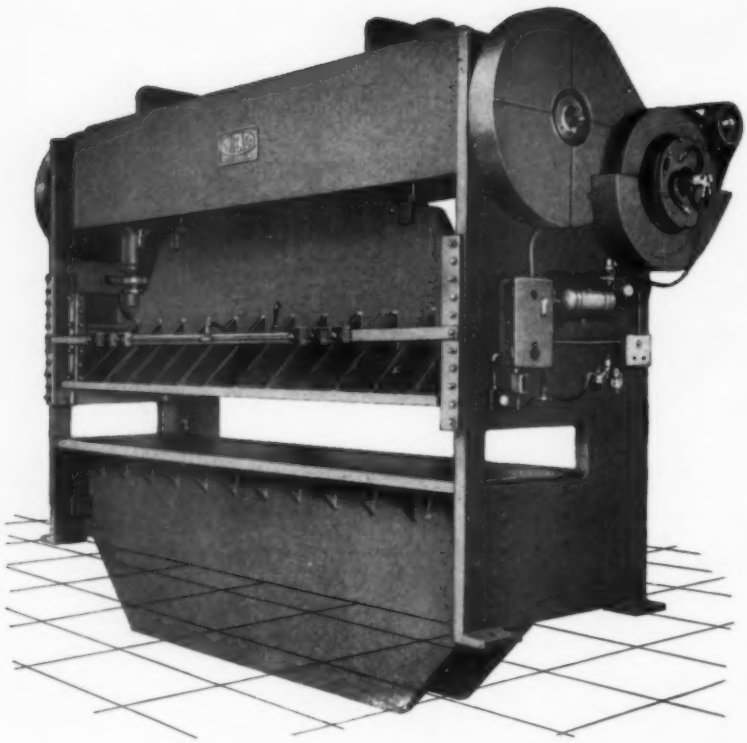
Write for Bulletin PB 6000-6, which describes in detail the features which make Elliott C-W motors outstanding.

WB-2

CIRCLE 297 READER SERVICE CARD

ENCLOSED MOTORS





CHICAGO DREIS & KRUMP

PRESSES
STRAIGHT-SIDE TYPE

large die area
capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

8874

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.
South Loomis Boulevard, Chicago 36, Illinois

sizes or larger. Transducers operate at 20 kc per sec.

This same basic unit is available with either single or multiple tanks which fit into the 25x25-in. cabinet top.

Company processes sample parts, at no charge, to assist in evaluation of ultrasonic cleaning.

Blackstone Corp, Jamestown, NY

MORE DATA? Circle 86, inside back cover

Portable crack detector, designated the Seal-Lock Magnetic crack detector, locates and outlines any surface crack or fault on any ferrous casting. Device operates on the principle of magnetic particle inspection. Unit weighs 20 lb and is easily operated by one man, from either a 110-v line, 12-v or 6-v battery. Complete unit includes probe, ac and dc connectors, sprinkling bulbs, grey magnetic powder, yellow magnetic powder, and instructions, all contained in a steel case.

United States Casting Repair Corp, 2500 E York St, Philadelphia 25, Penna

MORE DATA? Circle 87, inside back cover

Heavy-duty air hammer, Model SP500 is designed for heavy cutting, chipping, chiseling or grooving. It is 9½ in. long and weighs 4 lb. Metering trigger controls blows from zero to 2200 blows per min. Safety chuck holds tools securely. Air consumption is only 11 cfm at 90 psi. Price, with one chisel, is $109.50.

Superior Pneumatic Mfg Co, Inc, 4758 Warner Rd, Cleveland 25, Ohio

MORE DATA? Circle 88, inside back cover

Fork truck attachment consisting of a combination fork and boom is designed to handle bulky, non-palletized loads. Boom attachment extends 30 in. and has a capacity of 4800 lb; additional extensions are available. Attachment can be adapted to any of the company's high-lift fork trucks.

Automatic Transportation Co, Div of Yale & Towne Mfg Co, 149 West 87 St, Chicago 20, Ill

MORE DATA? Circle 89, inside back cover

Thread roll dies for producing external screw threads in fine and coarse thread series are available in all standard thread sizes from 6-32 to 1 in.-14. These aircraft-quality dies are made of special alloy steel. Threads are ground after heat treat-

NEW all-welded box frame construction

NEW heavier, more rigid tool guide post

NEW automatic tool welder

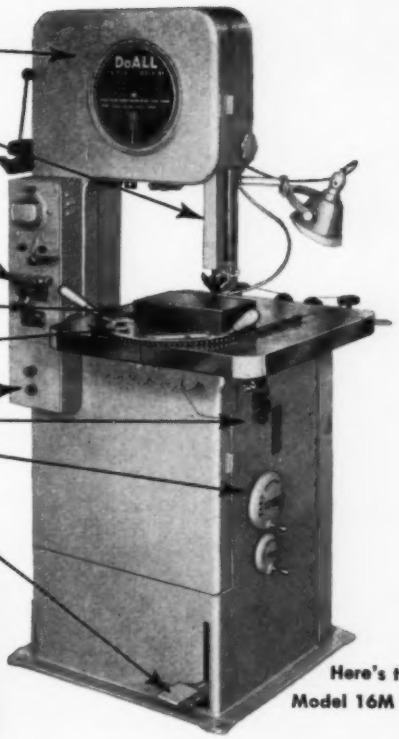
NEW heavy-duty drive—wide, stepless speed range

NEW precision-ground, non-glare, tilting table

NEW "job-tested" attachments

NEW easy-to-reach controls

NEW smooth, positive feed control



Here's the Model 16M (16")

NOW READY
2 new models

For Less Than $1000

You Can Own a Genuine DoALL Contour Machine

Now, at substantially lower prices, DoALL offers two new band machines—with the quality features and performance that defy competition. They have 16″ and 30″ throat and 12″ thickness capacity.

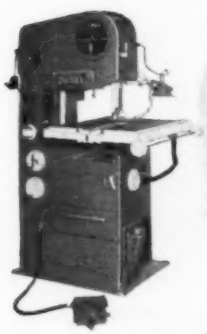
They're true multi-purpose machines—ideal for toolrooms, jobbing shops, sheet metal and maintenance shops. These new machines bring you the rigidity, power and operating ease that make DoALL the leader in the field.

With the Models 16M and 30M you are ready to handle a variety of assignments. In addition to sawing, the machines provide band filing, polishing, and friction cutting.

Entirely new, inside and out, these are modern, efficient, universal band machines. Variable-speed drive delivers smooth power for contour sawing of any machinable material. And accuracy is assured under even the heaviest cuts.

Let these new DoALL models help you beat rising costs. Ask for a free demonstration. Phone your local DoALL store. Or write for Bulletin 58-34.

B-52

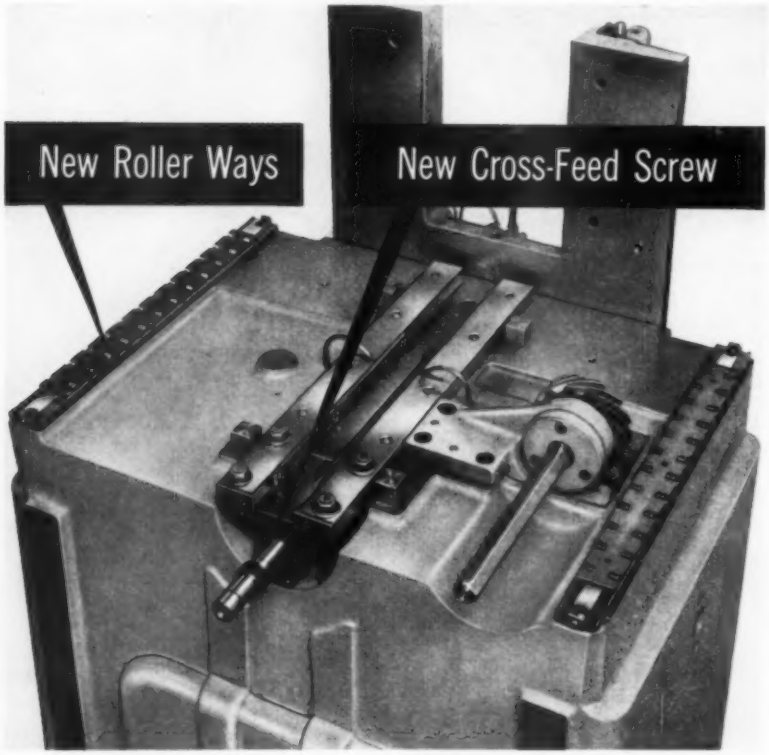


For high production DoALL offers its Contour-matics® teamed with Demon® HSS saw blades

THIS IS A TYPICAL DoALL STORE

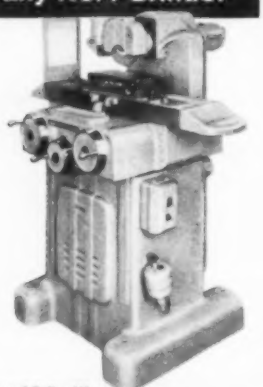
DoALL The DoALL Company
Des Plaines, Illinois

FIRST IN PRECISION—TAFT-PEIRCE NO. 1 SURFACE GRINDER



NEW SADDLE CONTROL CUTS TIME AND COST ON PRECISION GRINDING

Easy to install on any No. 1 Grinder



Grooved Roller Ways and Anti-Backlash Cross-Feed Screw feature have been designed for easy addition to all Taft-Peirce No. 1 Grinders now in use. If you own a machine purchased prior to 1956, these parts can be installed right in your plant by a Taft-Peirce Service Engineer, with minimum downtime. Order Today.

Now, extra smooth, positive saddle action assures outstanding repeatability, savings in operating time and greatly increased machine wear life.

New grooved roller ways eliminate sliding friction, make all movements easy and precise. New T-P designed Cross-Feed Screw and Anti-Backlash Nut now make it easy to get dramatic repeatability — sidewheel grind slots and shoulders without saddle creep; move and return saddle to original setting with duplication within .0001"!

This is just one of the many features that make the Taft-Peirce No. 1 Grinder *first in precision*. Prove it to yourself with surfaces so flat, they seal without lapping! A vernier fine-feed that allows you to grind within .00005" of any given dimension! For complete story on new saddle control, see your nearest Taft-Peirce representative or write direct for Bulletin MT-003.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

ment for maximum accuracy. Supplied in sets, the dies are of the flat single-face type for use in such thread rolling machines as National Boltmakers, Waterbury-Farrells and others. Other size and thread series are available on special order.

Standard Pressed Steel Co, Thread Roll Die Div, Jenkintown, Penna

MORE DATA? Circle 90, inside back cover

Drill and turning tool holder can be used to add a light turning or facing operation when the turret is full, or to provide a chamfer or sizing turn combined with a drilling or reaming operation. Holder can be used for right or left-hand turning, and minimum or no clearance is required. Drill head is adjustable for centering drill on work; tool slide is adjustable for length. Three sizes are provided, for the B&S No. 00, 0 and 2 machines.

American Cam Co, Inc, PO Box 2106, Hartford, Conn

MORE DATA? Circle 91, inside back cover

Fork Lift Truck Elevates 1000-lb Loads To Heights up to 60 in.

Designed to handle loads up to 1000 lb, the Champion Stroller, Model 777, has a lifting height of 60 in. Truck features include fluid drive transmission, dual lifting chains, 12-v electrical system, pushbutton self-releasing controls, and a travel speed of 2 mph at capacity load.

Truck is designed for a variety of handling and stacking applications in narrow aisles and on floors with

light load rating. It will operate effectively in 60-in.-wide aisles.

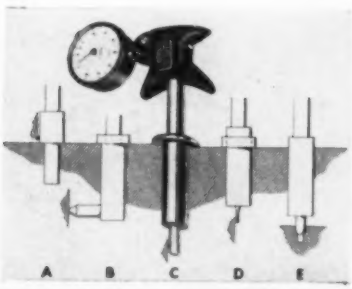
Over-all dimensions are 74½ in. high, 30 in. wide and 47½ in. long. Truck has 24-in.-long forks and weighs 555 lb. It sells for $777, complete with battery and charger.

Uhrden, Inc, Tubar Lift Div, Dennison, Ohio

MORE DATA? Circle 92, inside back cover

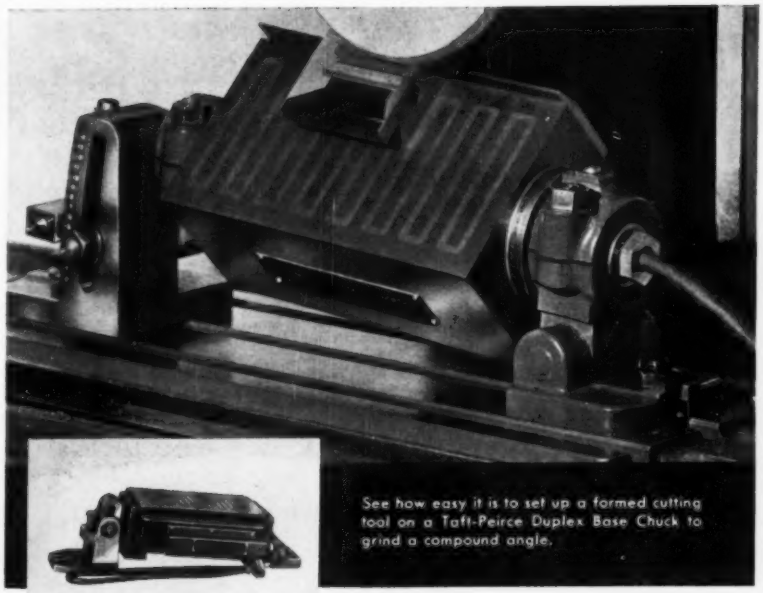
TOGGLE CLAMP, Model 500, features carbon steel work holding bars, straight handle, with right angle base. Plastic hand grip provides non-slip gripping surface. Sixteen models are available in this series, with recommended holding pressures ranging from 325 to 500 lb—*Consolidated Equipment Co, Inc, PO Box 2216, Pawnee Ave at K42 Highway, Wichita 1, Kan*

MORE DATA? Circle 93, inside back cover



Concentricity Gages Available In Several Styles

Diversified line of gages is designed to check hole location, alignment, and concentricity, or to explore a hole to check whether it is tapered, out of round, or machined out of square. The boron carbide gaging point is placed in line with the indicator to show the operator in which



See how easy it is to set up a formed cutting tool on a Taft-Peirce Duplex Base Chuck to grind a compound angle.

Adjustable Chucks are available as Duplex, Taper Base or Swivel Base, in work surface sizes from 4"x 8" to 10¼"x 60".

Superpower Sine Angle Magnetic Chucks eliminate clamps and bolts in positioning tricky angle jobs. Angles can be set quickly and precisely using standard gage blocks.

Work Drivers are a special Taft-Peirce time and money saver for centerless grinding. Strong holding power eliminates tailstock, speeds loading — easily adapted to a wide range of work sizes.

Taft-Peirce Adjustable Chucks Save Setup Time, Make Angle Grinding Easy

Speed, precision and simplicity go hand-in-hand when you use Taft-Peirce Adjustable Chucks for tough angular setups.

Superpower Duplex Chucks are a real time saver for grinding simple or compound angles, milling and grinding formed cutting tools, and dressing carbide tipped or steel single point tools. Swivels to 90 degrees either side of horizontal, tilts to 14 degrees, clamps rigidly at any setting.

Complete line of Magnetic Chucks from one source — Taft-Peirce. These are but a few of the great variety of standard and special chucks — both permanent and electro-magnetic — which you can get from Taft-Peirce. Send for Catalog 412, and try one of these in your shop, now.

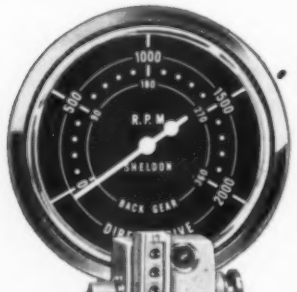
TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

CIRCLE 302 READER SERVICE CARD

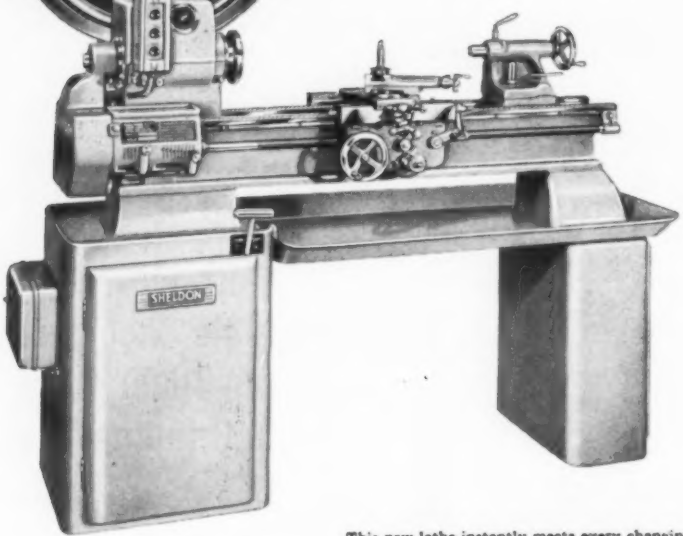
SHELDON *Variable Speed* PRECISION LATHES

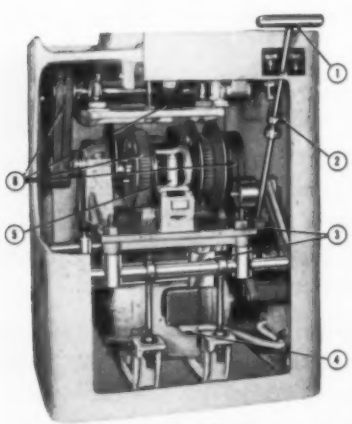
CHICAGO U. S. A.



. . . any speed INSTANTLY*

**Spindle speeds changed at 200 r.p.m. per second. Built-in tachometer permits accurate selection of speeds from 200 to 2000 r.p.m. in direct drive—40 to 300 r.p.m. in back gear.*





(1) T-Handle Speed Selector
(2) Micro-Switch Direction Control
(3) Speed Change Mechanism
(4) 2 H.P., Three Phase Motor
(5) Belt-tension Adjustment
(6) Multiple V-Belts

This new lathe instantly meets every changing speed requirement in the tool room, or quickly sets and holds to any prescribed speed for production runs.

Rugged, Heavy-duty Variable Speed Drive—an oversized unit with double V-belts throughout that delivers positive full-power to the spindle.

High Spindle Speeds—from 200 r.p.m. to 2000 r.p.m. (direct drive), from 40 r.p.m. to 300 r.p.m. in back gear.

Instant and Automatic (power driven) Speed Selection—Only 9 seconds to change from low to high speeds in either direct drive or backgear. Speeds are changed automatically when T-handle is lifted or pushed into engagement.

High Horsepower at All Speeds—Because the drive unit is oversized, it has larger belts which deliver maximum gripping power at all speeds. A 2 H.P., three Phase motors recommended.

Additional lathe features: Zero Precision tapered roller spindle bearings, 54 pitch gear box, heavy cast pedestal, tool-room accuracy. Optional accessories include hardened bed ways, L00 long taper key drive or 4" D1 Camlock spindles.

Sheldon Precision Variable Speed Drive Lathes are available in 11" or 13" Swing. Model WM-56-P (Illustrated) less motor and switch, $1,944.00 F.O.B. Chicago. Other 10", 11", and 13" Sheldon Precision Lathes from $898.00 up. Also 13" and 15" Sebastian Geared Head Lathes, Sheldon Milling Machines and Sheldon Shapers.

Write for Catalog

SHELDON MACHINE CO. INC.

4264 N. KNOX AVE. • CHICAGO 41, ILL.

Each Sheldon Lathe has its complete complement of production attachments and accessories

direction he is checking after the gage has been inserted. Illustration shows the styles available.

Zero Internal Gage Co, 11360 Schaefer Highway, Detroit 27, Mich

MORE DATA? Circle 94, inside back cover

Dial index feed features a completely different indexing motion at press speeds as high as 280 spm, as well as increased shut height on the press. Feed is equipped with a choice of 12 or 15-in. table diameters, has provisions for either 10 or 12 stations. Total table height has been reduced to 2⅜ in., a saving of 1/3 over model previously offered.

Benchmaster Manufacturing Co, 1835 W Rosecrans Ave, Gardena, Calif

MORE DATA? Circle 95, inside back cover

Man-made-diamond grinding wheels are reported to offer increases of up to 35% in grinding efficiency. Wheels are available in a complete line of all standard sizes and shapes, diamond depths, concentrations and grain and grade specifications in both resinoid and vitrified bonded styles.

Simonds Abrasive Co, Tacony & Fraley Sts, Philadelphia 37, Penna

MORE DATA? Circle 96, inside back cover

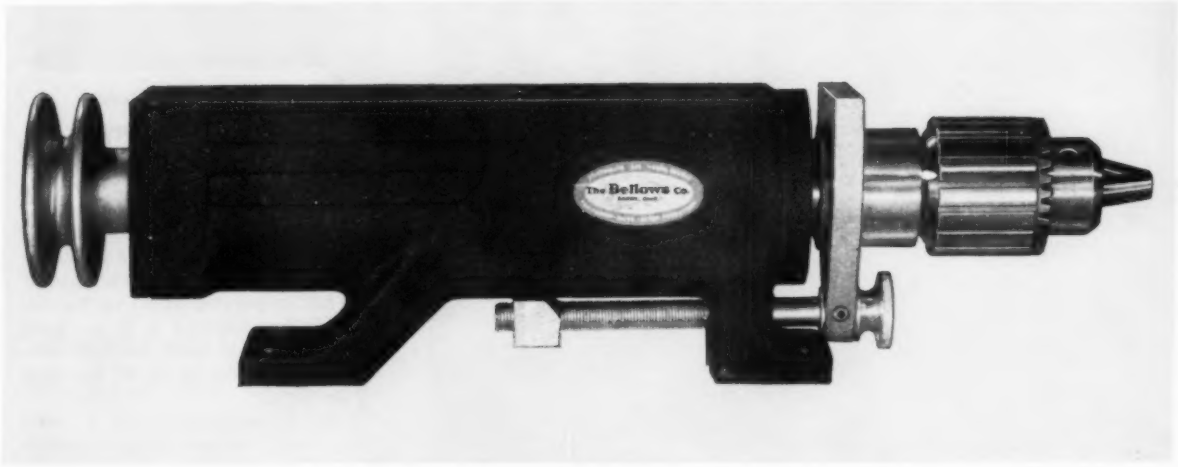
Wound rotor motors, Tri-Clad 55, are available from 5 through 150 hp. Type MR is intermittent rated for crane and hoist operation. Type M, rated for constant or adjustable speed, is designed for applications on industrial equipment, such as fans, compressors, and pumps.

General Electric Co, Schenectady 5, NY

MORE DATA? Circle 97, inside back cover

CHEAPEST WAY YET TO DRILL HOLES

*New Air-powered Bellows-Locke Drill Head Sells for only $95.00**



Not much bigger than a carton of cigarettes, the Bellows-Locke Model 22A Drill Head is the low cost answer for many machining operations in the softer metals, plastics and wood. Drill capacity in mild steel from No. 80 to 3/16" diameter drill. 2" stroke. Thrust two times air line pressure. Adjustable positive stop. Can be controlled by any standard four way air valve. Available also (at extra cost) with a built-in Bellows Electroaire Valve and hydraulic feed control.

**As illustrated less chuck and pulley.*

Model 22A Drill Head with optional "Hydro-Check" and "Electroaire" Valve Assembly

Write for Bulletin BL-22. Address The Bellows Co., Akron 9, Ohio, Dept. AM-958. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto 18.

1196-B

The Bellows Co.
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION
AKRON 9, OHIO

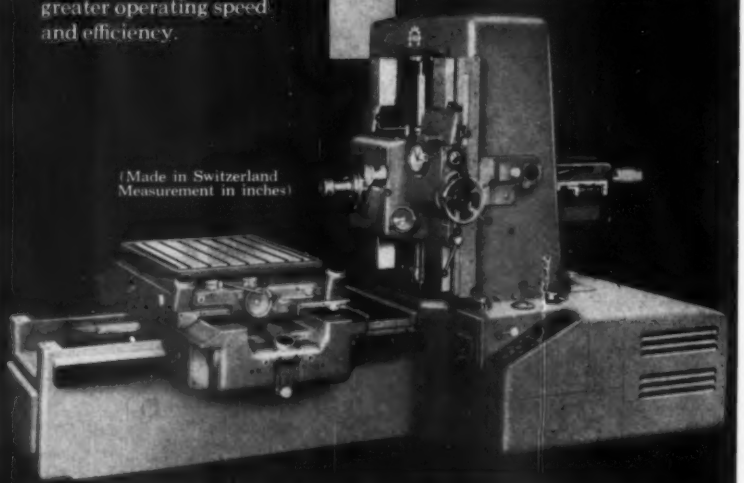
ACCURACY + VERSATILITY

the DIXI 75 gives you horizontal optical jig boring

- Projected optical setting—direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference.
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29½" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel

PLUS...

- Automatic positioning device available.
- Simplified controls functionally arranged for greater operating speed and efficiency.
- Hydraulic feeds and infinitely variable spindle speeds.
- Rear support optional.



(Made in Switzerland
Measurement in inches)

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York. — Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

See the Dixi 75 for the first time in U. S. A. in operation at booth 2144, National Metal Exposition, Cleveland, October 27-31.

MBI

M. B. I. EXPORT & IMPORT LTD.

A DIVISION OF MACHINERY BUILDERS, INC.

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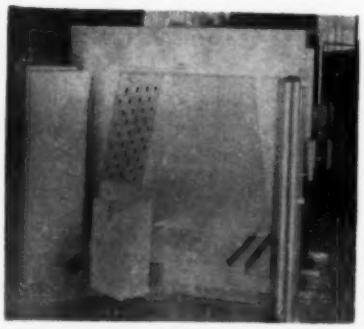
"Over 25 years' experience in designing and building machinery."



Electric Recirculating Oven Offered for Low-Temp Drying

Model DRF-555 Pereco unit is designed to operate at temperatures up to 300F and is heated by fin-strip elements. Heavy-duty welded steel cabinet is insulated with 3-in. Super X insulation. The 1500-cfm circulating fan is operated by a 1-hp 3-phase motor. Chamber size is 38 in. wide, 36 in. deep, 48 in. high; over-all cabinet size is 65 in. wide, 42 in. deep, 66 in. high.

Unit is equipped with a 7-day timer and circular chart recorder controller. Operating cycle may be adjusted to accommodate work requirements. Connected load is 9 kw.

Pereny Equipment Co, 893 Chambers Rd, Columbus 12, Ohio

MORE DATA? Circle 98, inside back cover

Step block and clamp sets include clamps for ½-in. bolts with standard 1-in.-wide blocks. Also available with the standard blocks are clamps for ⅜ and ⅝-in. bolts. Clamps for ½-in. and ⅝-in. bolts, together with units for ¾-in. bolts, are available in a heavy-duty set with blocks 1½ in. wide. Clamps for 1-in. bolts are furnished in a double-duty set with blocks 2 in. wide.

Northwestern Tools, Inc, 11½ Hollier Ave, Dayton 3, Ohio

MORE DATA? Circle 99, inside back cover

Silicone rubber compound, M-717, has compression-deflection characteristics approximating those of firm sponge, yet provides the tensile, tear and elongation properties of a higher-durometer compound. Anticipated uses include extruded sealing strips, molded parts and cut gaskets. Compound will be available in made-to-order sheets, moldings and extrusions. Samples and data available.

Connecticut Hard Rubber Co, 407 East St, New Haven 9, Conn

MORE DATA? Circle 100, inside back cover

Spiral Bevel....
Hypoid Bevel...
Zerol Bevel.....*
Straight Bevel...
Coniflex Bevel...*
Flywheel Ring Gears .....
Straight Spur.....
Spur & Helical...
Spline Shafts.....
Straight & Spiral Angular Bevel....
Assemblies.....

write ➧
(on your letterhead)

IS THE ANSWER TO YOUR GEAR PROBLEM IN THIS NEW 44-PAGE CATALOG?

The 10 gear types in which we specialize are comprehensively covered together with "vital statistics" on our 44 years of gear specialization. Our gear engineers are available for consultation.

*Reg. U.S. Pat. Off.

CIRCLE 306 READER SERVICE CARD

form INTERNAL THREADS without cutting

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CONVENTIONAL TAPPING METHOD
Produces chips that may clog flutes, cause loading. Result—excessive breakage.
Grain lines of metal are cut.
CHIPS

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- ZINC
- LEADED STEELS
- ALUMINUM
- LEAD
- DIE CASTINGS
- OTHER DUCTILE METALS

BESLY X-Press Tapping is a cold forming or swaging process for producing internal threads in ductile metals. The desired thread is formed under pressure. The grain fibers follow the contour of the thread, as in good forgings. They are not cut away as in conventional tapping methods. Complete application details are available — see your Besly distributor, or send coupon. *Where this new tool can be successfully applied the results are* phenomenal! *It would pay you to try them yourself — NOW!*

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"P" Style X-Press Taps—for through holes, or bottoming holes with ample clearance.

"B" Style X-Press Taps—for bottoming holes only.

"PC" Style X-Press Taps—same work as "P" Style series, except the root diameter controlled at 75% of thread.

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Your Name _____

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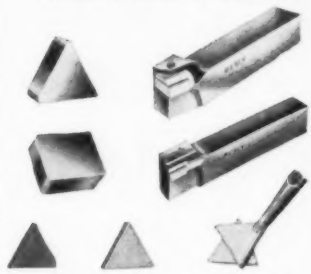
Grinders and Abrasives • Taps • X-Press Taps • Drills • Reamers • End Mills • Tool Bits • Gages • Carbide Tipped Tools, Blanks, Lapped Toss-away Inserts and Holders

BESLY *Complete* CARBIDE SERVICE

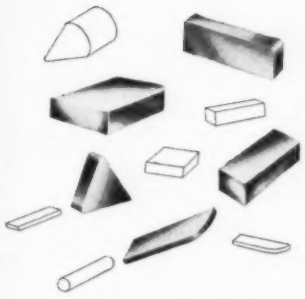
Lapped TOSS-AWAY INSERTS and HOLDERS



Commercial Finish | Besly Finish | Lapped, perfectly flat surfaces easily wring together.

Special Besly lapping process gives more tool life per cutting edge with less chipping and breaking. Wide range of sizes, positive and negative rakes. Holders in styles and shank sizes to fit the job.

BLANKS



In sizes, grades and styles for every cutting need. Standards include: reamer blanks, lathe center blanks, rectangular strips, solid cylinders, pulley grooving blanks and others. "Specials" made to order.

TIPPED TOOLS

Standard tools supplied in a variety of grades, sizes and styles for turning, facing, boring, chamfering, planing, milling, end cutting, threading and grooving in cast iron, non-ferrous, steel and steel alloy metals. Modifications and "specials" made to fit specific jobs.

only tools with perfect radii...

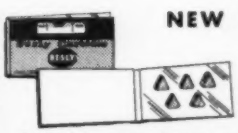
...means that BESLY carefully makes every Carbide Tool to the highest standards of **accuracy** and **quality**

Only the best materials and methods are used in their development — advantages which give you longer life, less downtime, fewer rejects and higher production rates at lower cost.

A complete range of standard styles and sizes is always available for *overnight delivery* through your Besly distributor. Ask him for Catalog 857 and for Besly's super-service on "specials."

Besly has a few select markets open for distributors who can handle carbides. *Write for details.*

NEW PACKAGING



Skin-Pak for Inserts and Blanks

Lapped toss-away inserts, carbide blanks, in standard package quantities, are conveniently arranged on 3" x 5" file card size fold-over cardboard pack secured with transparent polyester film for complete protection. Besly's new package prevents chipping of cutting edges and insures perfect condition, ready for instant use.

Plastic-Pak Cigarette Box for Tipped Tools

Standard tools inserted in Styrofoam and packed in individual, attractive plastic "cigarette" boxes. Provides easily identified, handy, fully-protected tool packages always ready for use.

SEE YOUR BESLY DISTRIBUTOR OR WRITE FOR CATALOG 857

BESLY

Engineering, Service and Specials . . . are a Besly specialty

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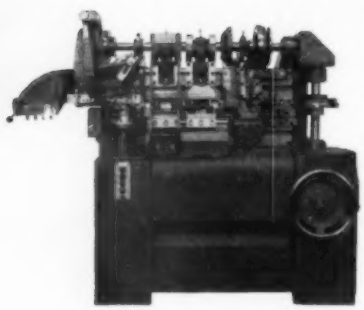
GRINDERS and ABRASIVES • TAPS • X-PRESS TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES • CARBIDE TIPPED TOOLS, BLANKS, LAPPED TOSS-AWAY INSERTS and HOLDERS

THE FIRST ENTIRELY NEW FOUR-SLIDE IN FIFTY YEARS!



A development of industry-wide importance is the Torrington Verti-Slide—a new vertical 4-slide that is the first major innovation in the basic field of wire and strip forming equipment in half a century!

The Verti-Slide was designed to meet a serious need for greater versatility, lower tooling cost, faster set-up time and reduced floor space. We urge you to investigate the new Torrington Verti-Slide in detail.

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO

FIELD REPORT . . .

$314 Million Contract . . .

. . . has been awarded to Convair Astronautics Div, San Diego, for research, development, and design of the Atlas ICBM. New order is in the form of a supplemental agreement to the basic contract for the Atlas.

Wheelabrator Forms New Division

New division of Wheelabrator Corp, Mishawaka, Ind, formed as result of acquisition of the former Crandall Engineering & Manufacturing, Inc, of Vicksburg, Mich, will be known as the Techline Division. Headquartered at Vicksburg, it'll manufacture and sell precision finishing equipment that includes barrel finishing machines and wet blast equipment.

Air Reduction Sales Co's . . .

. . . new $9 million plant at South Acton, Mass, will turn out 70 tons of liquefied gases per day. First of its kind in the region, the air separation and liquefication facility will produce liquid oxygen, nitrogen, and argon for industries, particularly shipbuilding and electronics.

Charleston Naval Shipyard . . .

. . . is scheduled to get a $25 million destroyer rehabilitation job which is estimated will entail some 200,000 man-days of work over an 18-month period. Project will involve five destroyers being transferred by the US to the West German government.

Westinghouse Contracts . . .

. . . totaling $22 million for production of Navy shipboard radio transmitters and radar equipment will be carried out at the company's electronics division in Baltimore and at the division's plant near Friendship Airport.

Rockwell Closes Calif Plant

Rockwell Manufacturing Co, Pittsburgh, has closed its Nordstrom Valve Div plant at Oakland, and shifted production to two new plants. Recently completed 180,000 sq-ft Nordstrom plant at Kearney, Neb, will produce the smaller valves; LFM Div at Atchison, Kan, will make units 16 in. and larger. Oakland facility, which had 300 employees in recent months, and 1500 at its peak, is for sale.

Illinois Tool Works Sets Up West Coast Div

The Chicago firm has established the Calinoy Division at Hawthorne, Calif, a suburb of Los Angeles. It'll function as West Coast headquarters for sales, engineering, and manufacture of metal plastic fasteners for special purpose applications in the missile and aviation industries. Division will also serve as the district sales office for distribution of products of the company's Shakeproof Division, Elgin, Ill, and the Fastex Division, Des Plaines, Ill.

Lockheed Gets New Neptune Order

Lockheed has a $22 million Navy contract for twenty-six P2V-7 Neptune antisubmarine airplanes and equipment. This 27th order for the Neptune since the first model was built in 1944 will extend production at Lockheed's California division factories in Burbank through Sept 1960. Previous orders involved production through Sept 1959.

GM's Allison Division . . .

. . . has a $16.2 million contract from Air Materiel Command for product support engineering services for J33, J71, and T56 engines, and a $2.1 million AMC order for gas turbine engine development.

New LA Industry Investments Top 1957's First Six Months

Sizable increase in new manufacturing industry growth during the first six months of 1958 compared with last year is reported by Los Angeles County. Total capital investment by new companies has reached $13,365,000 compared with $8,966,000 for the

". . . and then, in 1945, I designed an entirely new type of rotary actuator—."

WHY PAY MACHINISTS TOP WAGES TO WAIT AT A TOOL CRIB?

Stop costly waiting . . . use new McCaskey Tool Control System!

NOW! Completely eliminate time lost by highly-paid machine operators drawing and returning tools. New procedures in McCaskey's famous Tool Crib System allow crib attendants to prepare kits of tools for jobs in advance. Machine operators simply pick them up, or they may be delivered.

No Time Wasted At Tool Crib, More Working Time At Machines

Hundreds of plants report that the McCaskey System also reduces tool purchases by cutting crib inventories; reduces loss and theft; cuts costs so many ways it pays for itself in 90 days. Send for complete details today!

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☐ Rush complete details about the new features of the McCaskey System.

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PRECISION

...Our Key To Your Quality In Metal Cutting Specialties

Consult These CIRCLE R Specialists

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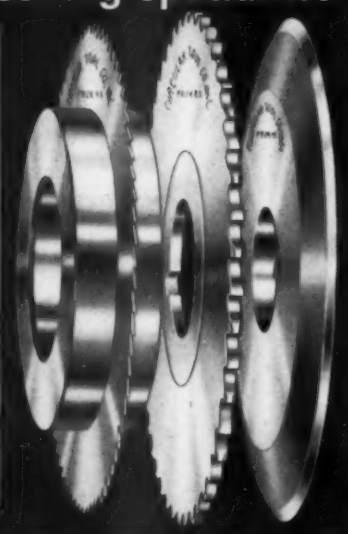
DAYTON — J. R. Kuntz Company
DETROIT — A. D. Spruce
HACKENSACK — The Eaton Company
INDIANAPOLIS — Walter F. Greene & Associates
MILWAUKEE — Ford Tool Co.
NEW YORK CITY — J. B. Cremonin (Export)
PHILADELPHIA — General Tool Sales Co.
PHOENIX — DiEugenio Tool Center
PITTSBURGH — Ralph Esposito & Co.
PROVIDENCE — Fred J. McMillen
ROCHESTER — James O. Horne
ST. LOUIS — B. C. MacDonald & Co.
WESTBURY, L. I. — The Eaton Company
MONTREAL — Humphrey B. Walton



CIRCLE R precision underwrites your precision by holding within very close tolerances, where required. And just as hairline precise in its own way is the skill of Circle R representatives. Call them in as consultants—especially on development of special circular cutting tools to ensure better production with controlled costs.

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CIRCULAR TOOL CO., INC.
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Specialists in Circular Cutting Tools Since 1923

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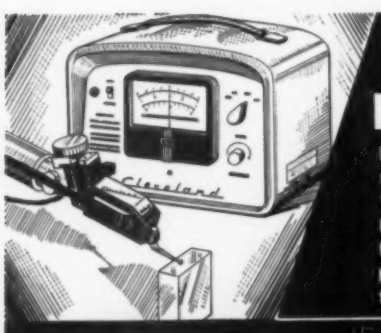

The MOST ACCURATE MOST RUGGED—
HEIGHT GAGE

Measures in thousandths, ten-thousandths or millionths of an inch.

The Cleveland INDI-AC is the only indicating height gage which protects the gaging element from accidental blows in any direction.

More INDI-ACs are sold than any other electronic height gage.

Write for FREE BULLETIN Cleveland INSTRUMENT COMPANY
735 Carnegie Avenue • Cleveland 15, Ohio

Field Report . . .

same period in 1957. Plant expansions are down, however—$71.6 million as against $90.3 last year.

Telecomputing Corp . . .

. . . has new contracts totaling $1.7 million from Western Electric Co for production of gyros to be used in the Nike-Hercules ground-to-air missile. Work will be done at the company's Whittaker Gyro Div in Van Nuys, Calif.

Sperry Western Adds To Inspection Services

Ultrasonic immersion inspection of materials is now being provided for the first time in the Southwest by Sperry Western, Inc, Houston, Texas. (Parent company is Sperry Products, Danbury, Conn.) Suppliers in the area, including machine shops and forging plants, previously had to ship aircraft parts to be ultrasonic-immersion inspected to the Middle West, East or West Coasts.

General Controls Co . . .

. . . has started construction of a $5.6 million facility for its Aircraft and Electronics Division in Burbank, Calif. Company manufactures controls for aircraft and missile automation.

Small Gas Turbine Power Package Developed by AiResearch

AiResearch Manufacturing Co, Phoenix, Ariz, has designed a new engine, comparable in size to a typewriter, that puts out 30 shaft hp, is 16 in. high, 13 in. wide, and weighs 45 lbs. Model GTP 30 ean serve as a power

(Continued on page 164)

Variety is the price of "Life" No single type of drill will give the longest wearlife under all operating conditions. One style is best for mild steels, another for plastics, another for tough stringy metals and so on. So it is wise to choose the particular type drill that will give longest wear-life and best results on each of your drilling jobs.

Besides the Jobbers Length drills shown here, GREENFIELD-AMPCO Drill Catalog No. 58 lists dozens of other styles...and lots of application information, too. WRITE FOR A COPY TODAY.

GREENFIELD TAP & DIE GREENFIELD, MASS.

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SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

"Come, Josephine, in my flying machine" — and what a thrill it was to ride in one of those breezy sky buggies!

But, business today is going places in the luxurious comfort of swift, sleek modern air liners. At the same time many a "modern" shop is operating with flying machine era tooling!

From airplanes to earth satellites, modern products require modern tooling. No matter how good your die heads seem to be, if they are "back numbers", it will pay you to investigate new Geometrics. The Geometric man can show you how a new Geometric can improve your threading operations and lower your costs too.

CALL YOUR GEOMETRIC DISTRIBUTOR TODAY

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NEW HAVEN 15, CONNECTICUT

BETTER MACHINING STARTS WITH ALCOA SCREW MACHINE STOCK

Alcoa Offers Screw Stock In Specific 12-ft. Lengths, No Increased Cost
PITTSBURGH, Aug. 30, 1958—Aluminum
Alcoa Adds Alloys 2024-T4, 6061-T6 to Screw Stock Schedule
PITTSBURGH, Nov. 11, 1957—Aluminum Company of America
Alcoa Extends Range Of Chamfered Ends At No Extra Cost
PITTSBURGH, Jan. 21, 1957—Aluminum Company of America today increased
Alcoa Stress Relieves Screw Machine Stock
PITTSBURGH, July 8, 1957—Stress-relieved
Alcoa Backs Distributor Stock With Mill Inventory
PITTSBURGH, March 18, 1957—
Alcoa Buys Turnings And Borings
PITTSBURGH, April 1, 1958—Alumi-
ALCOA
ALUMINUM
"ALCOA THEATRE"
Exciting Adventure
ALTERNATE MONDAY EVENINGS

THE BIG NEWS IN SCREW MACHINE STOCK COMES FROM ALCOA

We think there's more to service than making the best screw machine stock readily available in any quantity. ALCOA is consistently a step ahead with new economies, new design and production conveniences. Here are six ALCOA "firsts":

- Specific 12-ft lengths at no extra cost—all screw stock in rounds to 2⅞ in. dia. and hexagons to 2 in. across flats.
- Alloys 2024-T4 and 6061-T6 added to Screw Stock schedule. This means important economies through the addition of sizes formerly nonstandard which are now standard and groupable for price advantage.
- Chamfered ends at no extra cost for all rounds and hexagons up to 3 in. in alloys 2011-T3, -T8, 2017-T4, 2024-T4, 6061-T6.
- Full screw stock size range of alloys 2017-T4, 2024-T4, 6061-T6 stress relieved for improved machining characteristics.
- Mill inventory to supplement distributor stock and cover emergency requirements of mill customers.
- ALCOA agrees to purchase up to 60 per cent of customer's turnings and borings generated from alloys 2011-T3, 2017-T4, 2024-T4 and 6061-T6.

These and other reasons are behind the switch today to ALCOA® Aluminum Screw Machine Stock. Send in the coupon for your copy of *Alcoa Aluminum in Automatic Screw Machines*, the standard procedures manual for production men.

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Please send my copy of *Alcoa Aluminum in Automatic Screw Machines*.

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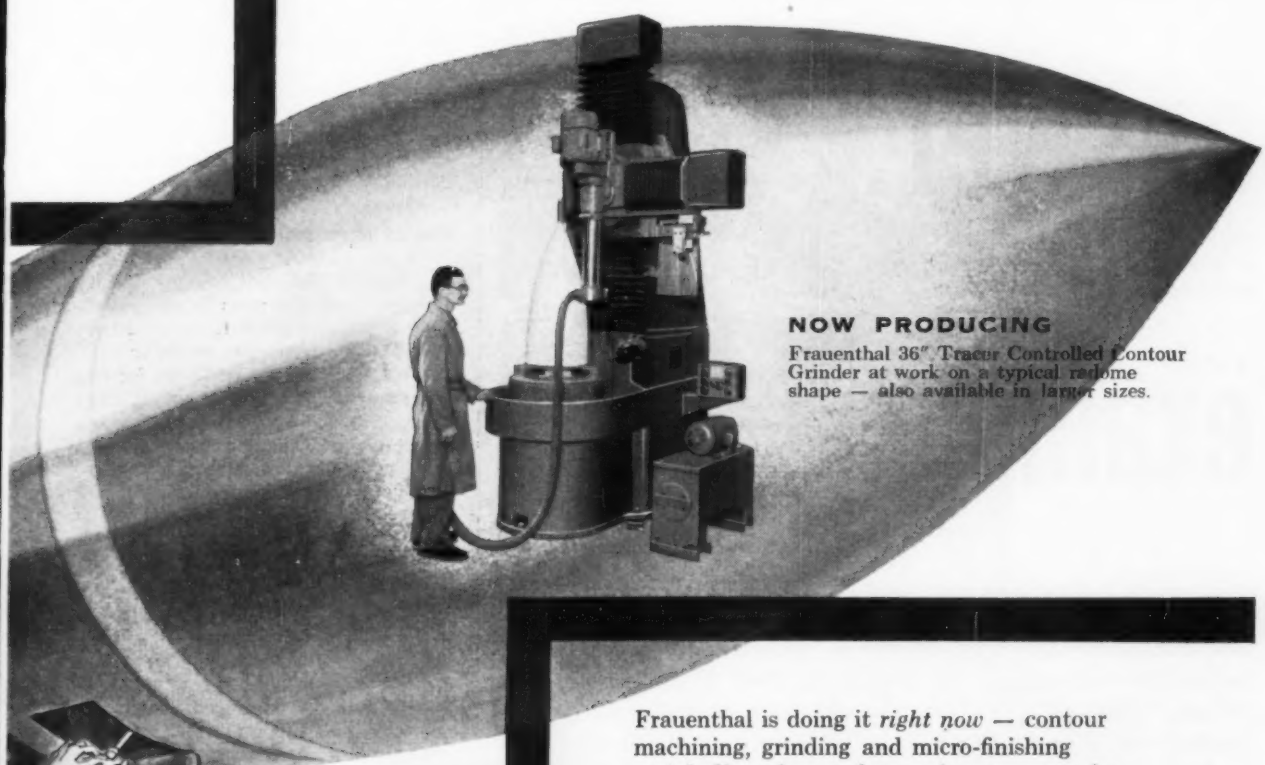
NOW PRODUCING

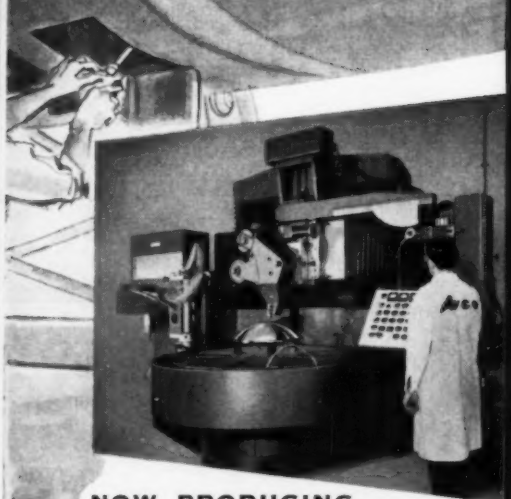
Frauenthal 60" dia. Contour Finishing Machine with 15' length capacity designed and built for Walter Kidde & Co., Inc.

Now... machining and grinding nose cone and radome contours for aircraft and I. C. B. M. re-entry missiles . . . FRAUENTHAL Rocket-Age machines are here!



NOW PRODUCING

Frauenthal 36" Tracer Controlled Contour Grinder at work on a typical radome shape — also available in larger sizes.



NOW PRODUCING

Frauenthal Precision Contour Turning and Finishing Machine. Producing to accuracy of ± .0005 over entire 60" diameter contoured surface, with 4 RMS maximum finish on re-entry nose cone.

Developed for AVCO Research and Advanced Development Division on the Titan program.

Frauenthal is doing it *right now* — contour machining, grinding and micro-finishing metal, fiber glass and ceramic nose cones for America's Space-Age missiles.

These creatively designed machines can generate nozzle throat contours for rocket motors, lay up or wind resinoid bonded material on formed mandrels, contour turn and grind mandrels or other difficult-to-work shapes and materials.

Contact Frauenthal now for forward-thinking machine designs. You'll get advanced engineering that *anticipates* your current and future requirements. All to help you profitably BREAK THROUGH in your field of operations.

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problem:

how to stop dust from damaging worker health and morale without an expensive central system.

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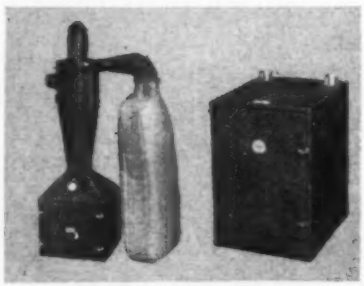
answer:

self-contained Torit Dust Collectors you can install yourself and move when you want.



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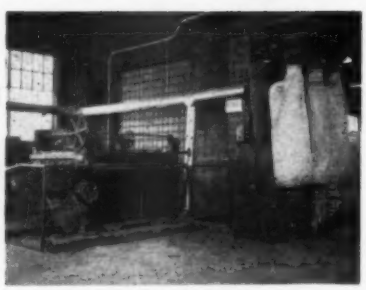
example:



one of the more than 35,000 Torit Dust Collectors now in use was installed at the Sico Mfg. Co., Minneapolis producers of industrial table units. According to Sico President, K. H. Wilson, "The lowest bid we received for a central dust control system was approximately $4,000. However, a Torit unit that could do the same job in our new plant cost about $900. We chose Torit because of this saving and because it would permit us to expand without costly remodeling. After a year of operation, we find that our Torit is economical to operate and we feel it provides greater efficiency than would be possible with a built-in system. And, when we expand, we can do it simply and easily by adding other Torit units as we need them."

•

FOR MORE FREE facts on dust problems, dust control and detailed data on the many models and types of Torit Dust Collector units, write today.

TORIT MANUFACTURING COMPANY

311 Walnut Street, St. Paul 2, Minn. Dept. 404

Field Report . . .

drive for generators, alternators, liquid pumps, blowers, and other applications requiring shaft power. For aircraft applications the unit can operate from sea level to 20,000 ft with shaft speed output available in either 6000 or 8000 rpm.

General Radio Co . . .

. . . has leased its Cambridge, Mass, plant to Epsco, Inc, Boston electronics manufacturer. The Boston firm, with its current staff of 350, expects to employ 800 at its new location. General Radio is moving all its facilities to a new plant in West Concord.

Rheem Manufacturing Co's . . .

. . . Aircraft Division, Downey, Calif, has two new contracts in excess of half a million dollars for production of pressure vessels. One of the orders is from Convair of San Diego for 55 titanium spheres to be used in the Atlas ICBM. Second, from Lockheed Aircraft, is for airstart bottles for use on the Electra jet. Follow-on production orders on this are expected.

Nicholson File Co . . .

. . . will end manufacturing operations at its Providence, RI, plant within a year, affecting more than 600 workers in the area. Company, with plants in Anderson, Ind, and Philadelphia, will retain general administrative and sales offices in Providence.

Hiller Aircraft Corp . . .

. . . is new name of Hiller Helicopters, Palo Alto, Calif. Company activities during recent years have been considerably diversified, but it's still very much in the helicopter business.

"Just married!"

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 EXTRUSION PRESSES AND PROCESSING MACHINES—*Sutton Engineering Co, First National Bank Bldg, Pittsburgh 22, Penna.* 12-page illustrated bulletin 50 describes hydraulic and mechanical equipment for extruding and finishing metal tubes, shapes, and bars. Presses covered include 750/900 ton to 1500/1870 ton capacity. Data also on hydraulic stretchers, detwisting machines, rotary swagers and straighteners.

2 HYDRAULIC PRESS BRAKES—*Cleveland Crane & Engineering Co, Wickliffe, Ohio.* 8-page catalog 2024A gives details on new line of Steelweld units. Construction features illustrated and described; dimensions and specifications tabulated.

3 AUTOMATIC WIRE CUTTER-STRIPPER — *Jennings Machine Corp, 3458 Ludlow St, Philadelphia 4, Penna.* 4-page illustrated bulletin contains informative data on the Acme unit with production rates up to 9000 pieces per hr, wire lengths up to 120 in. Tolerances, types of insulated wire handled, operating features covered.

4 DRY ABRASIVE CUTTING MACHINE—*American Chain & Cable Co, Allison-Campbell Div, 929 Connecticut Ave, Bridgeport 2, Conn.* 4-page folder DH-106 describes Model 1-A Sever-All for cutting practically all metals: solids up to 2 in. sq; pipe and tubing up to 3½ in. OD; angle iron up to 3 x 3 in.; and channels up to 4 in. Specifications, accessories.

5 FILING MACHINE—*Newage Industries, Inc, 222A York Rd, Jenkintown, Penna.* Bulletin illustrates and describes the Rindis power unit, bench model, for filing, trimming, and deburring (by disk and ring) a wide variety of small components. Material removed may be reclaimed.

6 40-TON PRESS—*Sales Service Machine Tool Co, 2363 University Ave, St Paul 14, Minn.* Illustrated bulletin gives details on OBI model No. 40 particularly suitable for die cast trimming, electronic work, etc. All-steel frame provides generous ram and bed areas and depth of throat to accommodate large diesets. Standard and optional features described, complete specifications included.

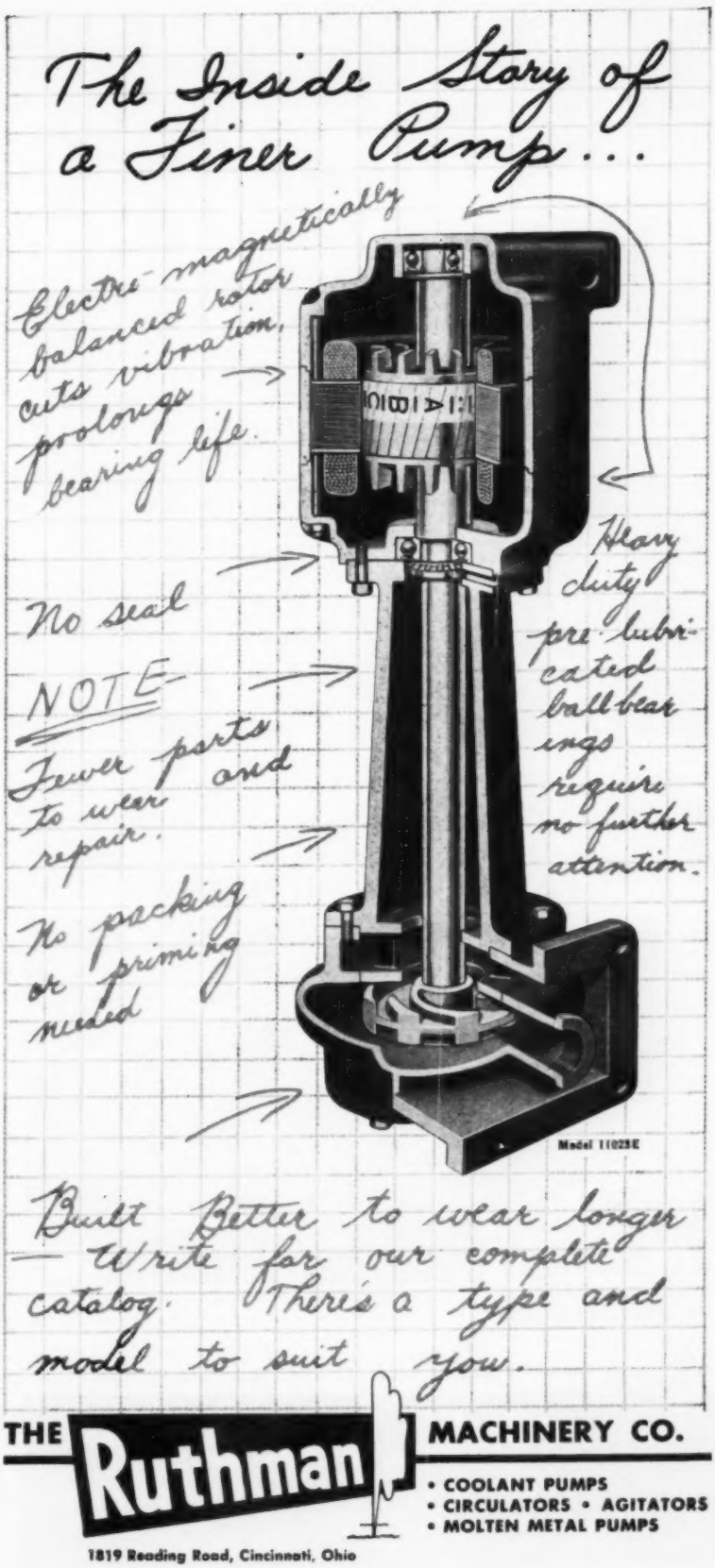
7 MACHINE TOOLS—*S & S Machinery Co, 140 53rd St, Brooklyn 32, NY.* Catalog sheets give brief descriptions, specifications, and illustrate all sorts of high precision tools available for sale or rent. Includes detailed listing of available toolroom, production, and fabricating machinery.

TOOLS AND ACCESSORIES

8 DIAMOND WHEELS—*Diacraft, Inc, 26538 W Seven Mile Rd, Detroit 40, Mich.* 28-page catalog covers metallic and resinoid bonded diamond grinding wheels made in all customary shapes and sizes for carbide grinding, as well as custom-made wheels for special applications.

9 MILLING CUTTERS — *McCrosky Tool Corp, Meadville, Penna.* 8-page bulletin 582 gives details on Series 900 cutters that use square and triangular throwaway carbide inserts. Sizes, dimensions, descriptions, illustrations of standard shell end, face, and half side mills, as well as variety of specials for unusual requirements.

10 LUBRICATION SYSTEMS—*Lincoln Engineering Co, 5703-27 Natural Bridge Ave, St Louis 20, Mo.* 4-page bul-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Electro-magnetically balanced rotor cuts vibration, prolongs bearing life.
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Fewer parts to wear and repair.
No packing or priming needed
Heavy duty pre-lubricated ball bearings require no further attention.
Model 11023E
Built Better to wear longer — Write for our complete catalog. There's a type and model to suit you.
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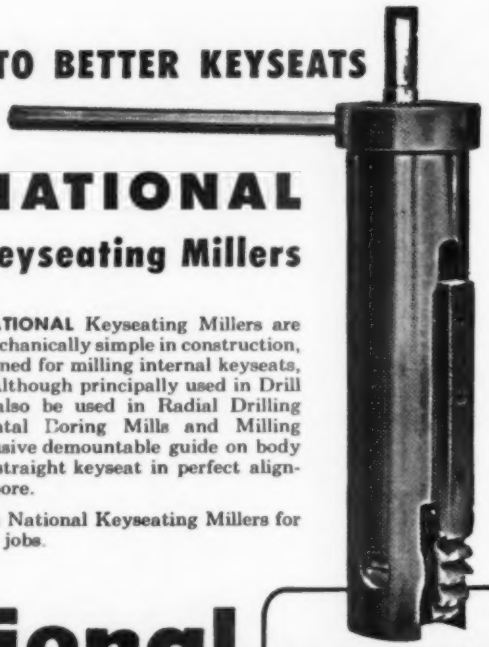
• MOLTEN METAL PUMPS
1819 Reading Road, Cincinnati, Ohio

THE KEY TO BETTER KEYSEATS



NATIONAL
Keyseating Millers

NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

You can depend on National Keyseating Millers for all your keyseating jobs.

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WRITE TODAY
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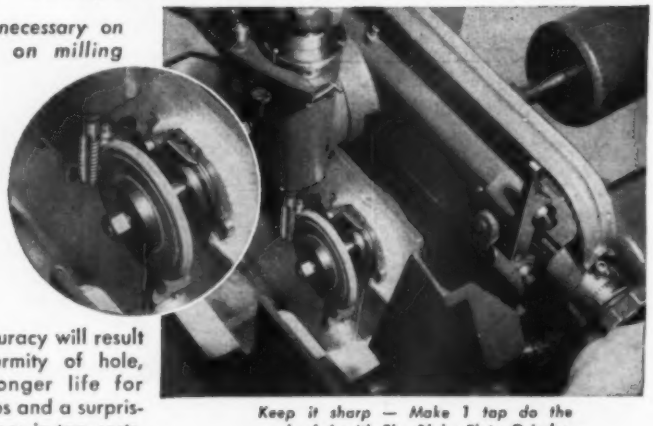
complete, handy size

CIRCLE 320 READER SERVICE CARD

NOW – You can control rake or hook angle and insure accurate indexing of cutting edges* of taps with the BLAKE FLUTE GRINDER.

*Just as necessary on taps as on milling cutters.



This accuracy will result in uniformity of hole, much longer life for your taps and a surprising savings in tap costs.

Keep it sharp — Make 1 tap do the work of 6 with The Blake Flute Grinder.

Write for bulletins on BLAKE Tap Sharpening Machines

EDWARD BLAKE COMPANY INC.
MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS
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Exclusive Distributors of:
Black Diamond Drill Grinders • Surface Finish Standards • Worcester Drill Grinders

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

letin 812 presents facts on Ram-Pump centralized power systems; illustrates pumping units for low and high-pressure applications. Systems are designed to provide automatic or semi-automatic lubrications of bearings, simultaneously, on single machine units while in operation.

11 TEMPERATURE DETECTORS—*Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Penna.* 36-page illustrated catalog EN-S4 presents detailed data on L&N's Thermohm detectors (resistance thermometers) for temps up to 1000 F. Tabular listing of specifications by application and design, as well as listing of accessory equipment for complete control systems and laboratory work included.

12 GROOVING AND CUTOFF TOOLS—*Acme Grooving Tool Co, 25806 W Seven Mile Rd, Detroit 40, Mich.* Folder provides rapid visual guide to types produced; illustrates Mirro-Lap finish; supplies data on finishes, tolerances, types, and tool materials.

13 LUBRICANT—*New York & New Jersey Lubricant Co, 292 Madison Ave, New York 17, NY.* 4-page bulletin 559 describes use of Non-Fluid Oil for shake-outs and vibrating screens. Discusses application for lubrication of pneumatic tools and equipment.

14 SPEED MEASURING INSTRUMENTS—*James G Biddle Co, 1316 Arch St, Philadelphia 7, Penna.* 20-page bulletin 35 (plus price list) pictures and describes lines of hand tachometers in five-range, triple-range, and single-range; speed indicators; tachoscopes; tachographs; accessories.

15 CHARTING AND LAYOUT—*Labelon Tape Co, 450 Atlantic Ave, Rochester, NY.* Five illustrated catalogs describe Graph-A-Plan system of materials and methods for preparation of charts and layouts used in industry. These instruction manuals covering Statistical Charting, Office Layouts, Plant Layouts, Organization Charts, and Process & Flow Charts, include brief description of the system, detailed instruction for layout and charting, and list of Graph-A-Plan materials.

HEAT TREATING AND WELDING

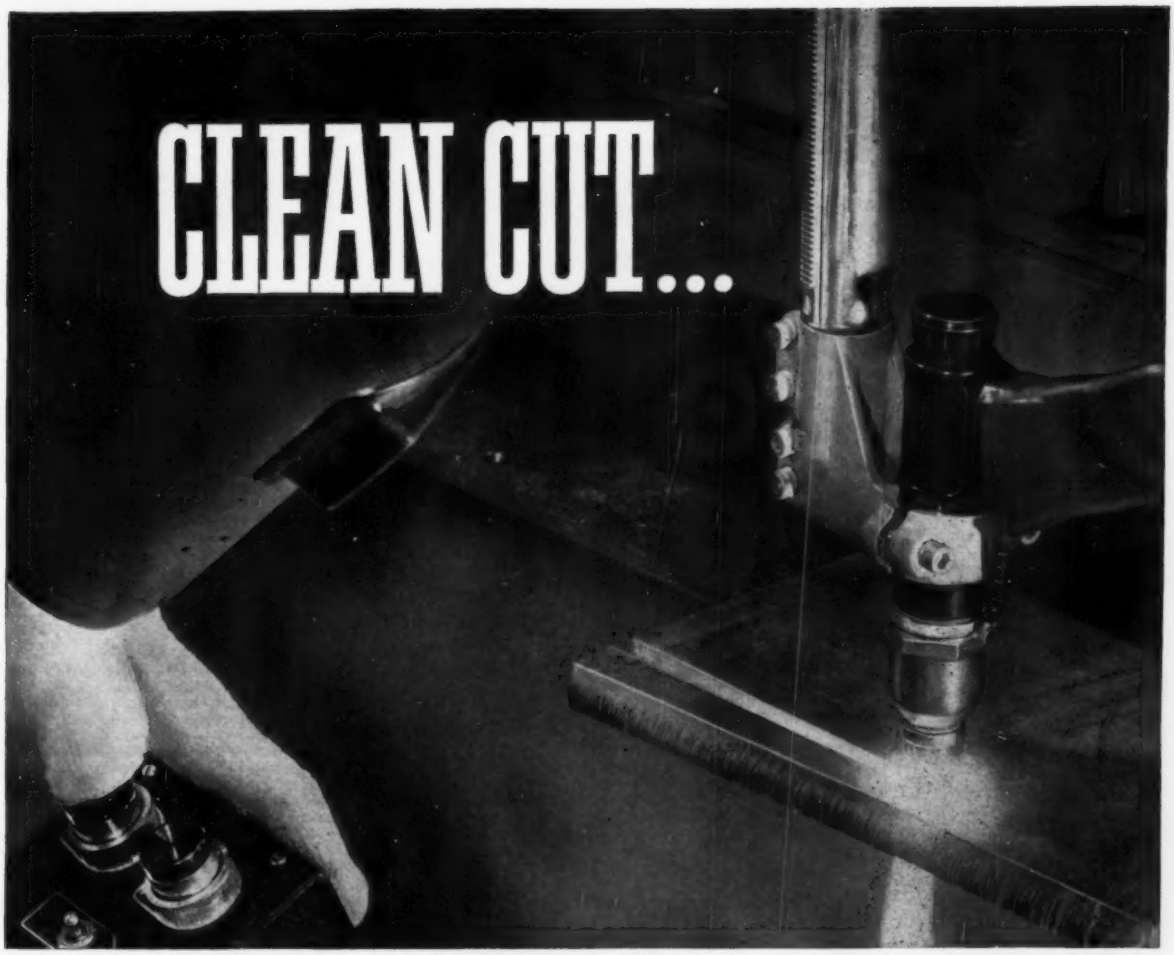
16 INDUCTION HEATING EQUIPMENT—*Magnethermic Corp, 3990 Simon Rd, Youngstown 7, Ohio.* 12-page bulletin HF-58-6 presents illustrated information on motor generator type units, 1000, 3000, and 10,000 cycles, for forging, heat treating, brazing, annealing, and shrink fitting.

17 SPOT WELDERS—*Taylor-Winfield Corp, Warren, Ohio.* 8-page bulletin 2-013A describes and pictures line of EB-1 air or foot-operated bench-mounted units for joining small parts of unusual metal combinations of precise shapes and sizes. Air-operated EB-1 welding heads may also be incorporated with dial feed tables or other equipment.

18 COLMONOY SEMI-AUTOMATIC WELDER — *Wall Colmonoy Corp, 19345 John R St, Detroit 3, Mich.* Illustrated 2-page brochure points out major construction features, lists variety of typical applications. Tube wires available for use with the unit also described.

19 FLUX IN METAL JOINING—*Eutectic Welding Alloys Corp, 40-40 172nd St, Flushing 58, NY.* 20-page digest (TIS 2839) of technical information discusses role of flux in metal joining, explains why a flux must be formulated as a companion of the specific welding, brazing, or soldering alloy.

(Continued on page 168)



...HELIARC Cutting turns hours to minutes

Before: It took 1½ hours to chip an 18-inch hole in an aluminum dome ⅝-inch thick. NOW—The hole is cut in *one minute*—with HELIARC Cutting.

Before: A 54-inch diameter dome hole in ⅝-inch rolled aluminum plate required about 5 hours, with chipping hammers. NOW—Manual HELIARC Cutting does it in about 4½ *minutes.*

HELIARC Cutting employs an extremely high-temperature, high-velocity arc that gives cutting speeds up to 1000 inches per minute on ¼-inch-thick material. It makes saw-like cuts, either square or beveled, in materials up to 3 inches thick . . . *and*, you can take the torch to the work. HELIARC Cutting is equally effective on aluminum, stainless steel, magnesium, copper, carbon steel, or cast iron.

See for yourself—ask your nearest LINDE representative to *prove* that HELIARC Cutting slashes time and labor costs over conventional methods. Call your local LINDE office today! Or write Dept. AM9, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

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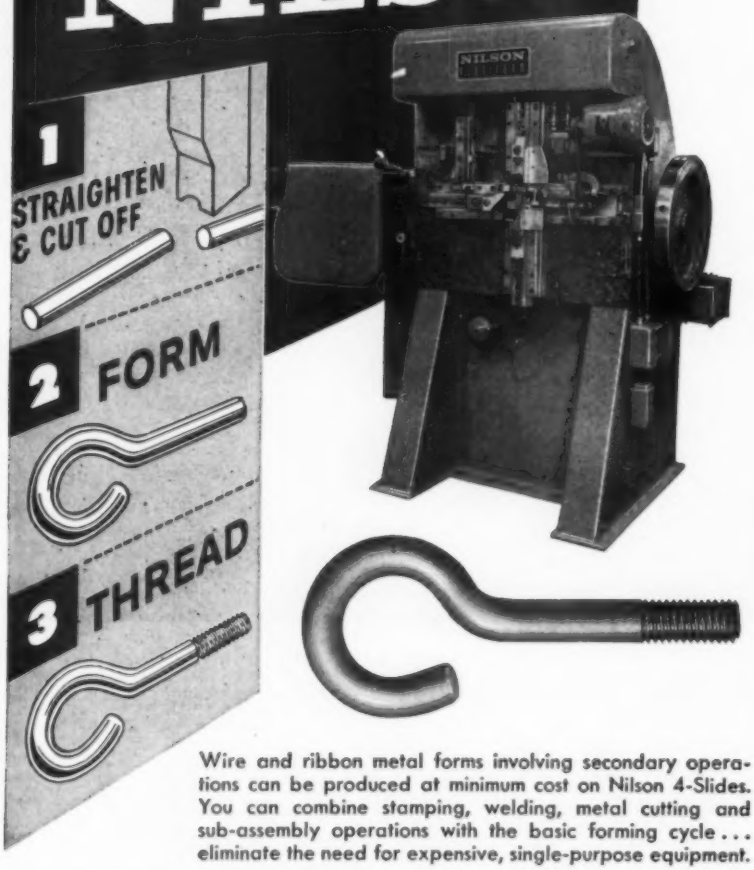
NILSON 4-SLIDES FORMING PRODUCTION PROFITS... *Automatically*

COMBINE OPERATIONS on a NILSON



Wire and ribbon metal forms involving secondary operations can be produced at minimum cost on Nilson 4-Slides. You can combine stamping, welding, metal cutting and sub-assembly operations with the basic forming cycle... eliminate the need for expensive, single-purpose equipment.

The Nilson "Vertiform" shown above, for example, has a die head mounted on the right-hand forming slide. Wire stock is straightened, cut off, formed and threaded—all automatically in one cycle!

In addition to the new "Vertiform," Nilson builds 17 models of horizontal 4-slides, including 5 ribbon metal machines with built-in press units. For a new approach to low-cost production of wire forms and small metal stampings, it will pay you to get in touch with Nilson.

Send today for the Nilson General Catalog on Automatic 4-Slide Equipment!

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THE A. H. NILSON MACHINE CO.
501 Bridgeport Avenue • Shelton, Conn.

AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

PLANT SERVICE EQUIPMENT

20 WET BLAST EQUIPMENT—*Wheelabrator Corp, Techline Div, 1140 Ave V, Vicksburg, Mich.* Bulletin 100 illustrates and describes applications of Liquamatte Model 43 designed for precision finishing.

21 VACUUM METALLIZING COATINGS—*Bee Chemical Co, 12933 S Stony Island Ave, Chicago 33, Ill.* 16-page brochure discusses coatings for metal, glass, and thermosetting plastics. Various coating application procedures, as well as coatings used in conjunction with vacuum metallizing are described.

22 RAPID-WHEEL GRAVITY CONVEYOR — *Rapids-Standard Co, 342 Rapistan Bldg, Grand Rapids 2, Mich.* 16-page bulletin RW-58 contains illustrated descriptions of variety of applications. Specifications, selection data, construction features and accessories included.

23 POLISHING AND BUFFING MACHINES—*Acme Manufacturing Co, 1400 E Nine Mile Rd, Detroit, 20, Mich.* 16-page illustrated catalog describes straight line type of automatic units available in seven types for low, medium, and high production operation.

24 SLING CHAINS—*American Chain & Cable Co, American Chain Div, York, Penna.* 28-page catalog DH-105 contains illustrated descriptions of ACCO line in 1-, 2-, 3-, and 4-leg styles, together with necessary hooks and attachments. Covers recommended work load limits, ordering information, safety factors, specifications, maintenance, table of wear and inspection procedures.

25 BUFFING EQUIPMENT — *H W Kramer Co, 130-30 Jamaica Ave, Richmond Hill, NY.* Catalog covers heavy-duty buffing lathe, bench model lathe, buffing wheels and hoods, ashing and pedestal hoods, buffing compounds, chamois and sheepskin buffs.

26 LIFT TRUCK ATTACHMENTS—*Little Giant Products, Inc, 1547 N E Adams St, Peoria 3, Ill.* 50-page catalog 585 illustrates and describes wide variety of mechanical and hydraulic attachments; offers 26 suggestions for added flexibility and efficiency of lift trucks.

PARTS AND MATERIALS

27 HYDRAULIC CYLINDERS—*Pathon Manufacturing Co, Cincinnati 12, Ohio.* 36-page illustrated bulletin 25 gives details on air and low pressure hydraulic units available in three series to suit majority of applications. Engineering data in tabulated form; installation and operating suggestions, mounting brackets, selector chart, force and rod size nomograph included.

28 COUPLINGS—*Snap-Tite, Inc, Union City, Penna.* 25-page general catalog provides information on standard line of quick-connect, quick-disconnect couplings including basic units for high and low pressure applications, impact in airlines, vacuum and very low pressures, and for hard-to-handle fluids. Construction details, spare parts and dimensions, accessories pictured and described.

29 SPECIAL PURPOSE STAINLESS STEELS—*Washington Steel Corp, Washington, Penna.* 28-page bulletin discusses MicroRold quality; applications and mechanical properties of ten types, and MicroMach extra-high-tensile stainless. Data included on finish characteristics; qualities of stainless vs aluminum; stainless steel selector; lab corrosion data; MicroRold sheet and strip specifications; weight estimate table; maintenance instruction.

Man's Eternal Struggle with the Machine

PROFITS ARE BEING SQUEEZED BETWEEN RISING MANUFACTURING COSTS AND THE NEED FOR COMPETITIVE PRICING!

The front office does know how critical your specification of equipment is . . .

Obviously, you and the other men in your plant, who devise production processes and select equipment, literally control the company's ability to make its product competitively.

That competitive ability earns the profit the company must have to stay in business.

Thus, you and the others, who specify equipment purchases, deal as directly with your company's profit as do the Board of Directors and entire executive staff.

Sciaky knows your important relation to the company's profits, too. That's why Sciaky resistance welding and production equipment is built to satisfy the requirements of *your* particular application. That's why Sciaky equipment is tested and proved to do *your* job *before shipment.*

As a result, it's easier for you to do a better job. You get the right equipment at the right price . . . you need only a minimum of time and cost for production tryout . . . you don't suffer from excessive rejects or re-work operations.

Why take less than the full advantage of consulting with a Sciaky Application Engineer the next time you are considering equipment. No obligation, of course.

A major manufacturer of air conditioning units took that advantage. As a result his production requirements were satisfied with a relatively low cost, versatile assembly line of standard welders adapted with simple tooling. The excessive cost of a complex, fully automatic machine (which was originally thought necessary) was avoided. Write for "Resistance Welding At Work," Vol. 4, No. 10 for details of this ingenious solution.

SCIAKY

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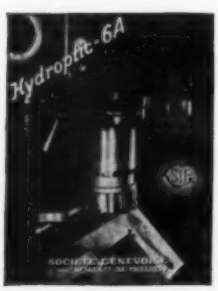
. . . attained with the New SIP HYDROPTIC 6A Jig Boring and Milling Machine

Due to unprecedented cutting ability . . . increased range and capacity . . . simplification of controls . . . and ease of operation, the HYDROPTIC 6A is unmatched in performance.

Up to **30% increase** in productivity has been realized with the AUTOMATIC COORDINATE REPEATING DEVICE DIR (optional equipment) which repeats successively the initial settings made during the machining of the first workpiece.



For complete information, send for Catalog No. 1149.

As with all SIP HYDROPTICS, *accuracy is based on* SIP *High Precision* STANDARD SCALES.

AMERICAN SIP CORPORATION • 100 EAST 42 STREET, NEW YORK 17, N.Y.

Henry M Heyn (left) has been elected president of Surface Combustion Corp, Toledo, and president of the Surface Industrial Division. **Robin A Bell** (right) has been named executive vice president of the company and president of the Janitrol Division. Mr Heyn was formerly vice president and general manager of the Industrial Division, and Mr Bell was vice president and general manager of Janitrol. **James P Farrell** has been named vice chairman of the board of Surface, and **Albert J Buckenmyer** a director of the company

Lester W Buechler, formerly chief engineer at the Electric Products Division of Vickers Inc, has been appointed general sales manager of the Division, St Louis, Mo

NAMES IN THE NEWS...

Walter P Lotz, general sales manager of Landis Tool Co, Waynesboro, Penna, has been appointed vice president, sales. **John A Cover,** manager of distributor sales, succeeds Mr Lotz. **John J Keane,** manager of direct sales, has been promoted to assistant sales manager.

C C Pearson, former vice president, manufacturing, at Beech Aircraft Corp, has joined Lockheed Missile Systems Division as assistant director of manufacturing.

Norman A Fletcher has been appointed manager of manufacturing for the Valve Division of Minneapolis-Honeywell Regulator Co, located in Fort Washington, Penna. Mr Fletcher succeeds **Howard J MacDonald,** now serving as general manager.

William W Kearney has been appointed manager of manufacturing at Baker Industrial Trucks, Division of Otis Elevator Co, Cleveland. He moves up from the post of manager of production control. **Jan Uyterlinde** has been named product manager.

Karl H Epple has been appointed director of engineering and **Edward W McLaren** director of manufacturing for the Heli-Coil Corp, Danbury, Conn. Mr Epple was formerly design manager, and Mr McLaren plant engineer.

W W Henning has been appointed manager of engineering of the farm equipment group of International Harvester Co. He was formerly engineering manager of the Farm Tractor Division.

H Rodney Bolin has been elected president of Automatic Spring Coiling Co, Chicago. **Robert G Lambrecht** has been named general manager.

Carl Rhodes has been promoted from plant manager to general manager of the Adrian (Mich) Division of Hoover Ball & Bearing Co.

Glenn F Whiteley has been appointed manager of the Indianapolis plant of Heppenstall Co, Pittsburgh. He has been serving as chief metallurgist there.

Erwin Koenig, vice president of Foote Bros Gear & Machine Corp, Chicago, has been assigned added duties as director of engineering.

Paul Hinds, personnel manager of Hyster Co at Peoria, Ill, has been named assistant manager of the Tractor Equipment Division. **Dean Polson** has been made manager of the Martin Trailer Division plant at Kewanee, Ill.

Ray O Shaffer (left), president of Welex, Inc, Ft Worth, Texas, has been named board chairman of Reed Roller Bit Co, Houston. **John F Maher,** former president of Oil Center Tool Co, Houston, is new president of Reed. He replaces **Rex G Hamaker,** who has retired.

Paul Gibian, manager of manufacturing for Milton Roy Co, Philadelphia, has been elected vice president, manufacturing

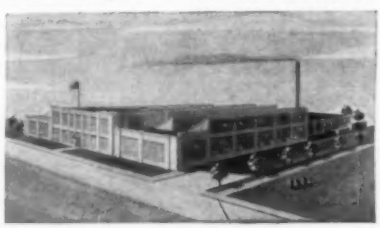
3 ways CDT can help you

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



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ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NAMES IN THE NEWS...

George Erskine has been elected vice president of Meteor Manufacturing Corp, Buffalo tool manufacturer that is moving operations from Buffalo to expanded facilities at Emporium, Penna.

Clyde G Stratton has been appointed manager of Aeroquip Corp's new Dallas plant. He was formerly manager of the company's industrial warehouse in Dallas.

Philip R Samwell, vice president of Friden, Inc, San Leandro, Calif, will take on additional duties as general manager of the company.

Donald J MacFadgen, chief engineer for Koehler Aircraft Products Co, Dayton, Ohio, has been promoted to vice president, engineering. **Harold A Herkenhine,** assistant chief engineer, succeeds him. **George Foster,** West Coast design engineer, has been named vice president, West Coast operations.

Walter V Tracy, assistant general sales manager of Monarch Aluminum Mfg Co's (Cleveland) Commercial Castings Div, has been named general sales manager of its Commercial Div.

Duane R Branaka, formerly Detroit district sales manager for Warner Electric Brake & Clutch Co, has joined Valvair Corp, Cleveland, as sales manager.

Bruce L Mims, chief engineer of Barden Corp, Danbury, Conn, has been elected vice president, engineering.

Walt Schindler, director of engineering for Vard, Inc, Pasadena, Calif, maker of screw and control mechanisms, has been named vice president, engineering.

George G Spehn has been named manager of the Chicago Sales Div of D A Stuart Oil Co, Ltd, Chicago manufacturer of special lubricants for the metalworking and automotive industries. He was previously manager of automotive lubricant sales in Detroit.

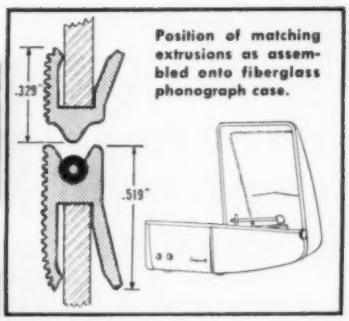
Forrest Emery has been named sales manager for Grant Gear Works, Inc, Boston, Mass.

Gregory R Taylor has been named sales manager of Mueller Brass Co's new Cold-Prest Impact Extrusion Division, Port Huron, Mich. He was formerly sales engineer of steel extrusions for Adrian Engineering & Manufacturing Co.

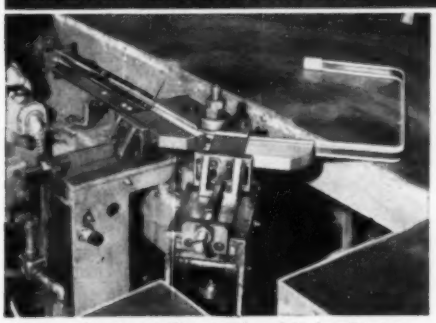
800 Bends An Hour

IN ANODIZED EXTRUSIONS ON PINES MODEL ¾ BENDING MACHINE

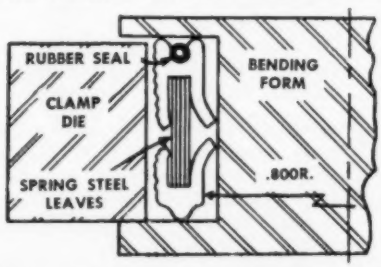
View of 12-year-old Pines Model ¾ Bending Machine at Kinkead Industries Incorporated, Chicago, bending decorative aluminum extrusion closure strips.



Position of matching extrusions as assembled onto fiberglass phonograph case.



Close-up showing tooling employed in bending two matching extrusions simultaneously. Black strip separating two extrusions is spring-steel mandrel used to prevent collapse of open sections during bending.



Extrusions are positioned in tools as illustrated above. Die surfaces are nylon coated to prevent scratching the anodized finish. Rubber seal is installed in straight lengths before bending.

How Accurate Bending Simplifies Fitting of Scratch-Free, Matching Closures on Phonograph Cases

A unique tooling setup on a Pines Model ¾ Bending Machine enabled Kinkead Industries Incorporated, of Chicago, to fill an order for accurate 90° bends in matching aluminum extrusions. Bends are made simultaneously in a pair of extrusions at net production averages of 800 bends, or 100 pair of frames, per hour. Accurate forming simplifies corner fitting and assembly of the completed pieces used as closure strips on phonograph cases. As illustrated, the two extrusions are mounted on spring-steel strips which serve as an internal mandrel and prevent collapse of the sections in the bend area. Bending the two strips simultaneously assures perfect mating when assembled onto the fiberglass cases.

Ends Meet in Butt-Fit Without Trimming

Before bending, both of the extruded shapes are anodized to a beautiful, bright finish. Die surfaces are faced with nylon to protect the decorative finish and prevent marring during the bending operation. No lubrication is required. The uniform accuracy of the bending operation also eliminates any need for trimming the pre-cut stock. The ends meet in a butt-fit. Kinkead's fine line of stainless steel and aluminum products, known as "Kintrim," is another example of the quality bending results that have long been achieved on Pines Benders. Look to Pines for the practical solution to *your* bending problems.

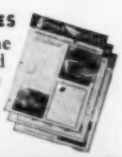
PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

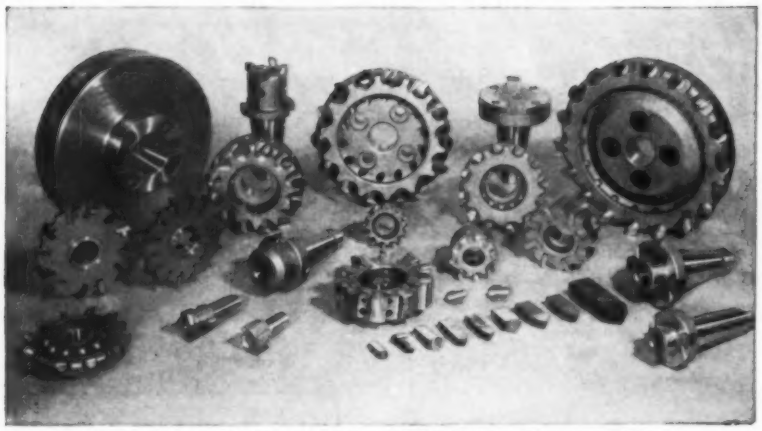
672 WALNUT • AURORA, ILLINOIS

WRITE FOR FREE CASE STUDIES

For case study reports on the cost-cutting advantages of cold forming the "Pines-Way," write for free copies of Pines News. For analysis on any job, ask a Pines representative to call.



PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW "JOYDEX"

This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive, or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

NAMES IN THE NEWS...

Frank Bobrick has been appointed chief engineer for Wells Industries Corp, California manufacturer of missile and aircraft ground handling equipment. He was previously assistant general manager of Greer Hydraulics Engineering Corp.

Everett J Long has been appointed director of the Transducer Division, Consolidated Electrodynamics Corp, Monrovia, Calif. Mr Long, who succeeds **Kennett W Patrick,** vice president in charge of Monrovia divisions, was previously assistant director for operations of the Transducer Div.

Arnold H Maremont, Chicago industrialist, has resigned as board chairman of Motor Products Corp, Detroit. **Victor Nemeroff,** vice chairman of the board, and president of H & B American Machine Co, succeeds Mr Maremont.

Joseph T Miller Jr has been named manager of bearing sales for Hoover Ball & Bearing Co. He was previously assistant manager in charge of OEM sales.

William T Wilbur has been appointed chief engineer of Progressive Welder Sales Co, Pontiac, Mich. **Stephen E Jerome,** formerly works manager, has been named factory manager.

Avery C Adams, president and chief executive officer of Jones & Laughlin Steel Co has been named to succeed **Adm Ben Morreel** as board chairman. Adm Morreel's resignation will become effective Sept 30.

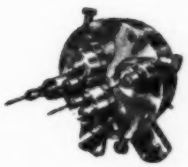
J Tom Maidens has been appointed sales supervisor for the End Mill Division of Eclipse Counterbore Co, Detroit. He was formerly district manager for Morse Twist Drill Co.

Howard R Hoskin has been named sales manager of S W Card Division of Union Twist Drill Co, Mansfield, Mass. He has been serving as sales engineer in Ohio and Pennsylvaina for the past three years.

Fremont Fisher has been appointed general sales manager for Electric Auto-Lite Co's Electrical Products Group, Toledo, Ohio. Mr Fisher was formerly vice president and director of sales for the Fort Worth Steel & Machinery Co in Texas.

J T Cataldo, sales manager and assistant general manager of International Rectifier Corp, El Segundo, Calif, has been named vice president, sales.

FULLY ADJUSTABLE DRILLING HEAD

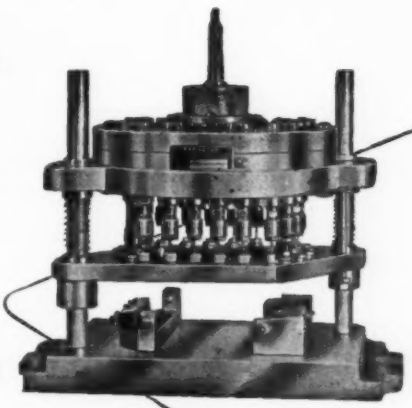


Here's a light, compact tool with a wide range of adjustment. Can drill on squares, rectangles, circles, triangles and irregular patterns.

FOR MULTIPLE DRILLING OF HOLES ON PRODUCTION RUNS . . .

ERRINGTON

FIXED CENTER DRILLING HEADS with JIGS and FIXTURES



Custom Built to Your Specifications. Send Blueprint for Quotation Without Obligation.

ADJUSTABLE TAPPING HEAD

Fully geared. Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case.

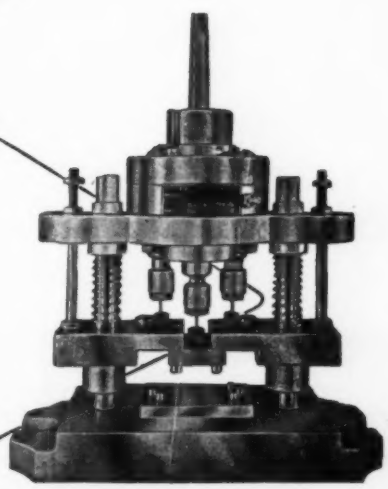
ADJUSTABLE DRILLING HEAD

This versatile tool permits you to take advantage of a wide range of adjustment without overhang.

UNIVERSAL JOINT DRILLING HEAD

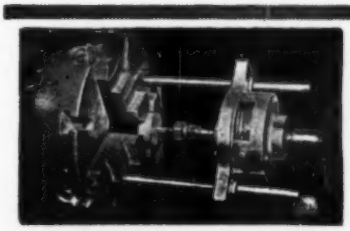
This dependable tool is adjustable to any pattern of holes. Available with 4 to 12 spindles. All aluminum housing construction, thrust bearings and gears turned on spindles.

Do more . . . and do it better with Errington Fixed Center Drilling Heads. They drill any number of varied size holes on different elevations. The head has grooved thrust ball bearings at all thrust points and hardened bronze radial bearings. Heat treated spindles and gears, of one piece turned from solid bar stock. It is geared approximately 2:1. All enclosed in a sand-cast aluminum case and cover, with alemite pressure lubrication.



See us at BOOTH 1076

Send for Complete Catalog



AUTO-REVERSE TURRET LATHE TAPPING HEAD

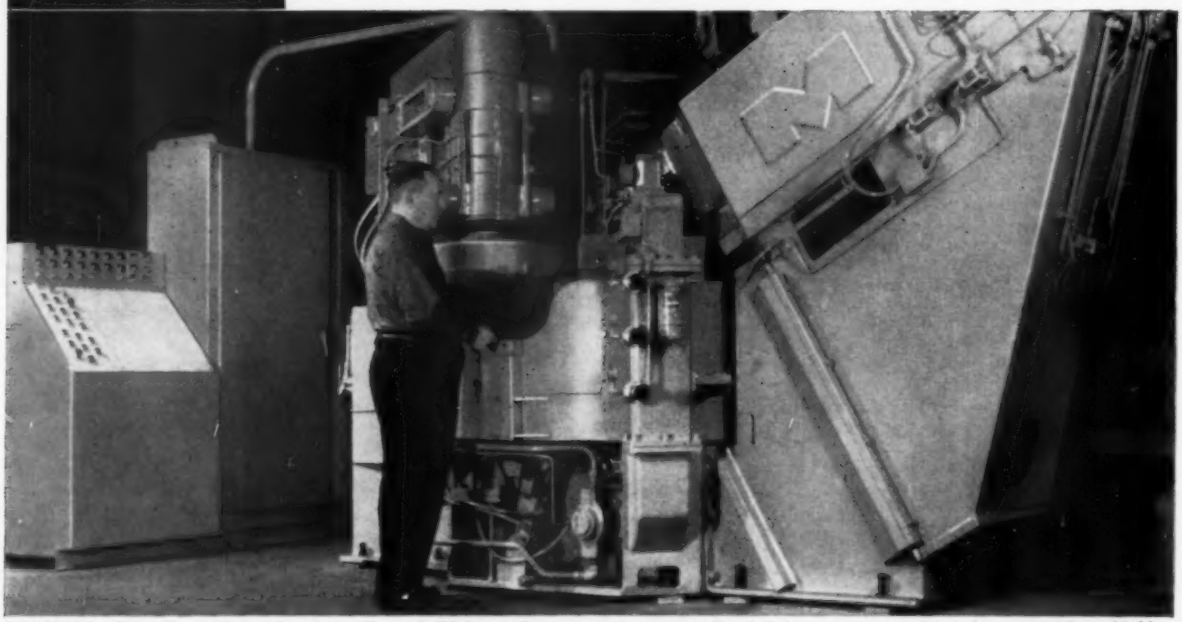
A new tool, practical, time-saving, money-saving. In a turret lathe setup it allows you to tap the hole and back out the tap without stopping the work or reversing the machine.

ERRINGTON MECHANICAL LABORATORY, INC.
Established 1891
Main Office and Plant: STATEN ISLAND 4, N. Y.
Export Office: STATES TRADING COMPANY 401 Broadway, New York 13 Cable Address: STRADESCO, N. Y.

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS

Machining competitively priced parts?

Consider the unexplored opportunities to save with special, multiple-operation grinders!



EXAMPLE: This 4-station Mattison "special" has three work stations, plus a load and unload station, for completely automatic grinding of head bearing sections for rock bits. The workpiece never "waits" between operations. Investment in a highly automatic special machine is long-range assurance against obsolescence and competitive disadvantage.

If your parts are competitively priced, perhaps you can save a great deal of time, floor space, and cost by combining a variety of grinding operations into a package.

An example is this special four-station Mattison grinder for rough- and finish-grinding the head bearing sections of rock bits. The work package consists of: surface-grinding the top of the bearing pin, rough-grinding the pin diameter and adjacent shoulder, chamfering the pin, and finish-grinding the pin diameter and shoulder.

Size is controlled automatically by gages which reset the grinding wheels to compensate for wheel wear. The entire machine cycle is automatically controlled. The operator's console is equipped with indicator lights that provide a visual record of work status.

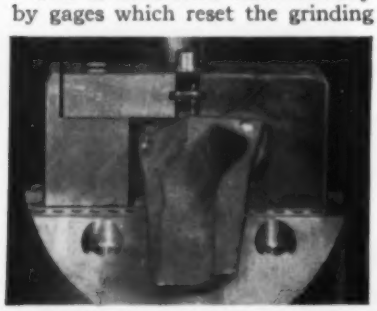


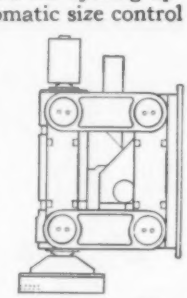
Fig. 1—This adjustable workholding fixture is easily adapted to a variety of pin sizes, from 3½ in. to 9⅞ in. Work shown is in the load-unload station.

Despite the fact that this is a high-production machine, it has considerable flexibility and can handle parts for bits ranging from 3½ in. to 9⅞ in. sizes. Adjustable fixtures (Fig. 1) adapt the grinder to a relatively wide range of work.

Parallelogram head

The Mattison patented parallelogram head is used at station No. 2. Advantages of this design include: completely sealed, preloaded bearing journals; elimination of play commonly developed in conventional tool slides; and all mechanisms completely sealed to exclude grinding dust and/or coolant.

The parallelogram head on this machine features hydraulic feed working against an adjustable lead screw stop; and both rapid approach and fine feed strokes, with controllable feed rates and adjustable limits. The lead screw features a variable increment infeed, making the head ideally suited for cycling operations and automatic size control systems.



Somewhere in the variety of cylindrical and surface grinding operations in your plant, there may be (and probably is) enough work and high volume to justify special, multiple-operation grinders. Why not investigate these opportunities and give your plant a chance to be different from, and better than, your competitors who rely on "conventional" machining methods. It won't cost you anything to find out—just pick up your phone and call:

MATTISON MACHINE WORKS
Rockford, Illinois Phone 2-5521

Want more information?
Send for bulletin describing variety of Mattison "special" grinders for high-production machining.

MATTISON
HIGH-POWERED PRECISION SURFACE GRINDING

Finish obtained in machining REX M-2-S eliminates the need for finish grinding this 4" x 4" unground double thread cutting hob.

Hobs seldom need finish grinding when made of low cost REX M-2-S

This is the actual finish obtained – without costly finish grinding – with REX M-2-S,® Crucible's *sulfur-bearing*, tungsten-molybdenum type high speed steel. The chemistry of this resulfurized steel readily provides the machinability needed for the final, critical "backing-off" operation in making hobs. It doesn't tend to tear or produce rough finishes – as nonsulfur-bearing steels of this type so often do.

REX M-2-S costs about 30% less than T-1 types, too, because it's lower priced per pound, and provides 5.4% more linear feet per pound.

Crucible REX M-2-S is also equal in red hardness to the T-1 types, and even more resistant to abrasion. It's also tougher than any other tungsten type high speed steels, and hardenable over a wider range than any other molybdenum high speed steels.

Qualities like these make REX-M-2-S extremely suitable (and economical) for broaches, chasers, lathe tools, reamers, taps and hobs as well as other tools normally requiring high speed steel.

For further information, just ask for details on REX M-2-S – or all the Crucible high speed steels today. Write: *Crucible Steel Company of America, Dept. T101, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE STEEL COMPANY OF AMERICA

Canadian Distributor – Railway & Power Engineering Corp., Ltd.

CIRCLE 331 READER SERVICE CARD

ERICKSON

QUICK CHANGE HOLDERS

...for use with your standard MMS tapered tools
...designed for presetting of tools

Now you can use your present standard MMS tapered tools with the *new* Erickson Quick Change Holders. That means you get the double production advantage of Erickson's *high precision coupled with the rapid change feature.*

Several different models comprise the line: Morse taper holders for boring mills and radial drills, milling machine holders that fit standard spindle tapers, turret lathe holders that increase turret lathe tool-holding capacity, straight shank holders with #30 or #40 MMS socket. These holders take Erickson Collet Chuck milling machine adapters in both regular and heavy duty types, end mill adapters, shell and face mill adapters, Morse taper adapters, boring head adapters, and chuck adapters for Jacobs internal taper.

AA-7455

A call or card will bring the Erickson representative on the double. Meantime write for your copy of Catalog G "Erickson Quick Change Holders."

ERICKSON TOOL COMPANY

34359-9 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CONTOUR POLISHING

A 3M Case History Report

DEBURRING-POLISHING TIME CUT 40% WITH "PG" WHEELS

MANUFACTURER: LeTourneau-Westinghouse Company

ADDRESS: Peoria, Illinois

PRODUCT MANUFACTURED: Earth Moving Equipment

3M ABRASIVE USED: "PG" Wheels

HOW 3M ABRASIVES ARE USED: "PG" Wheels used for contour polishing of air brake backing plate. Malleable cast-iron plate requires super-smooth finish on two concentric rings, to provide air-tight seal against neoprene air diaphragm.

OPERATIONAL DATA ON 3M METHOD: Two 1" x 10" "PG" Wheels, Grit #150 Three-M-ite Resinbond Cloth, mounted side-by-side on shop-made polishing shaft uniformly deburr and polish plate ring surfaces in 2-3 minutes.

OPERATIONAL DATA ON PREVIOUS METHOD: Overall deburring and polishing was by hand-rubbing with emery cloth. Time required was 4-6 minutes per plate.

PROVEN ADVANTAGES OF 3M METHOD: "PG" Wheel method, as opposed to hand finishing, allows more uniform finishing as abrading pressure can be more constantly applied with machine. Average time saving of 40% realized.

WANT MORE INFORMATION? Send for free manual, "Modern metal finishing with 3M 'PG' Wheels." Write to 3M Co., St. Paul 6, Minn., Dept. AK-98.

"PG" Wheels are manufactured in U.S.A. by 3M Company, St. Paul 6, Minn. Export: 99 Park Avenue, New York. Canada: London, Ontario

3M Coated Abrasives

"PG" WHEELS

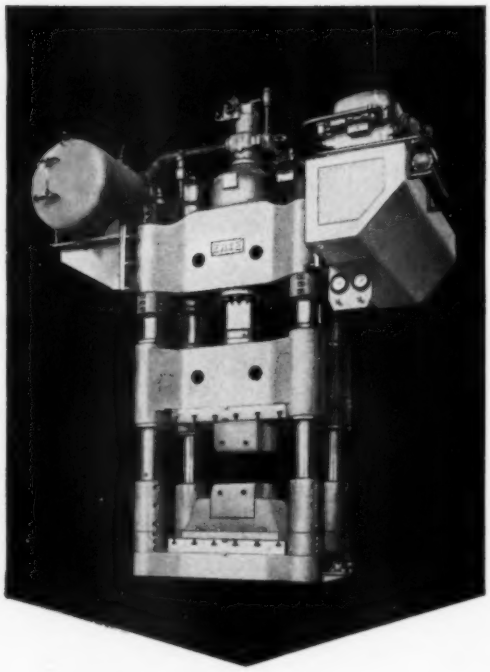
MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

PRESS or HAMMER?

..which is best for your forged product?



When it comes to open die forgings, there are as many different opinions on what equipment is best as there are open die forge shops and open die forgings.

But, before adding any new equipment, the wise forge shop operator talks with Erie Foundry Company . . . the firm that makes the best in *both* hammers and presses!

Erie's all-steel open die hammers, single frame and double frame, have justly earned their reputation as the industry's most rugged hammers. And now the newer, fast-acting Erie flat die forging presses are proving to be the ideal equipment for meeting the most exacting requirements for any hydraulic press.

So . . . which is best for you—hammer or press? For expert and *specific* advice, talk to the recognized leader . . . Erie Foundry Company. Just call or write.

ERIE FOUNDRY CO. ERIE 4, PA.

ERIE

World's Greatest Name in Forging Machines
Since 1895

Introducing the NEW MODEL 1-A SEVER-ALL Machine... CUTS AT 3 to 6 SECONDS PER SQUARE INCH—ECONOMICALLY

MANY EXTRA FEATURES AT A DELIVERED COST UNDER $500

You get the cut quality and capacity of machines nearly three times as expensive when you use the new Model 1-A SEVER-ALL oscillating dry abrasive cut-off machine. Available from your distributor's stock. Here's why the #1-A SEVER-ALL is ideal for industrial and machine shop operations:

BIG CAPACITY • Up to 2″ square solids, 3½″ O. D. pipe and tubing, 3″ angle iron, and 4″ channels . . . of cold rolled, stainless, and alloyed steel; cast iron; and nonferrous metals. Wheel oscillation, an exclusive feature in this price range, provides this *above-average* capacity.

SPEED • Cuts a 2″ x 2″ hardened steel bar in 16 seconds . . . other shapes and sizes at 3 to 6 seconds per square inch.

QUALITY • Clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting.

ECONOMY • In addition to low initial cost, the Model 1-A SEVER-ALL is inexpensive to operate . . . occupies minimum floor space . . . requires little or no set-up time . . . eliminates annealing costs . . . gives more cuts per wheel because of oscillation.

SIMPLICITY • Just two SEVER-ALL cutting wheel specifications will do *all* your SEVER-ALL cutting jobs. A positive, screw-type vise holds all regular shapes, and an adjustable work stop provides speed and accuracy.

ANGLE CUTS • Optional accessory permits cutting angles up to 45° in either direction.

NEW SEVER-ALL AVAILABLE FROM DISTRIBUTORS

Very likely your own distributor already stocks the Model 1-A SEVER-ALL machine and wheels. If not, let us know, and we'll give you the name of your nearest SEVER-ALL distributor. Also, we'll be glad to send you complete details on this new machine. Just ask for **Bulletin DH-106.**

ALLISON-CAMPBELL DIVISION AMERICAN CHAIN & CABLE

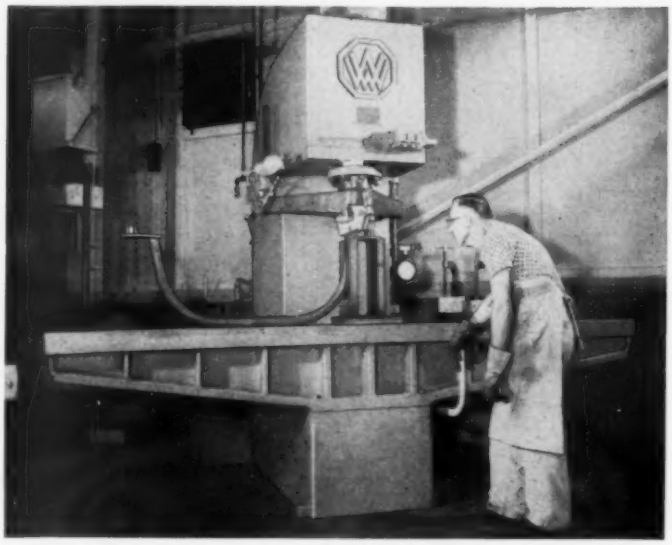
ACCO

923-S Connecticut Avenue, Bridgeport 2, Conn.

WILLIAMS-WHITE HYDRAULIC GAP FRAME PRESSES

- Sensitive and positive control of bending ram
- Self-contained hydraulic pumping unit and motor
- Adjustable stroke and hydraulic pressure
- Integral oil reservoir

The above are standard features built into every WILLIAMS-WHITE Hydraulic Gap Frame Press. Regularly built in capacities from 15 tons, with cast or welded steel plate frames, their simple design, sturdy construction, accessible work area, low initial cost and long, trouble-free life are factors to be considered when purchasing a hydraulic press for bending and straightening operations. Why not discuss your requirements with us before you buy?



The press illustrated has 100 tons capacity, 120" x20" removable table, 20" daylight and 16" stroke. It is located in a plant of North American Aviation, Inc.

BUILDERS OF MACHINERY SINCE 1854

WILLIAMS-WHITE & Co.
304 EIGHTH ST. • MOLINE, ILLINOIS
PRESSES • BULLDOZERS • BENDERS • PUNCHES • SHEARS

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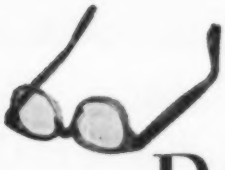
CALIFORNIA, Los Angeles: George A. Davies Machinery Co.
MISSOURI, St. Louis or Kansas City: Robt. R. Stephens Machinery Co.
NEW YORK, Buffalo: H. D. Thweatt Co.
OHIO, Cincinnati: Columbus or Dayton: Seifreat-Elstad Machinery Co.
OREGON, Portland: Allied Northwest Machine Tool Corp.
PENNSYLVANIA, Pittsburgh: Frank Ryman's Sons
Wynnewood (Phila.): Edw. A. Lynch Machinery Co.
WASHINGTON, Seattle: Perine Machinery and Supply Co.
WISCONSIN, Milwaukee: Pagel Machinery Co.

CIRCLE 336 READER SERVICE CARD



Mr. Branden-burg

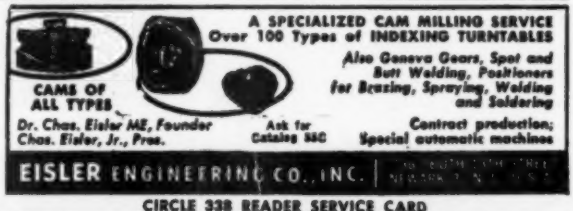
chose the LeBlond 16" Heavy Duty Engine Lathe (Lathe F). Sorry, we can't give you the names of the other five.

LeBLOND of Cincinnati

The R. K. LeBlond Machine Tool Company
Cincinnati 8, Ohio

World's Largest Builder of a Complete Line of Lathes for More Than 71 Years.

(See "The Case of the Discerning Lathe Buyer," pages 42-43)



A SPECIALIZED CAM MILLING SERVICE
Over 100 Types of INDEXING TURNTABLES

Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering

CAMS OF ALL TYPES

Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.

Ask for Catalog 58C

Contract production; Special automatic machines

EISLER ENGINEERING CO., INC.

CIRCLE 338 READER SERVICE CARD

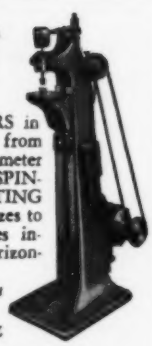
TANNEWITZ

VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 F.P.M. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.

The TANNEWITZ WORKS Grand Rapids, Michigan

CIRCLE 339 READER SERVICE CARD

GRANT



RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

CIRCLE 337 READER SERVICE CARD

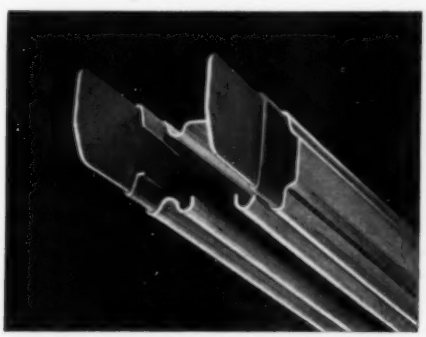
CIRCLE 340 READER SERVICE CARD

New Universal Lighting System—

for flexible, low-cost lighting

Here's efficiency and economy, too. BullDog's new 20-amp Universal Lighting System both feeds and supports lighting fixtures . . . requires no supplementary fusing. Fixtures can be positioned at any spot throughout the entire system . . . are quickly and easily moved to meet changes in lighting requirements. No rewiring or electrical downtime, either.

Listed by Underwriters' Laboratories, this new Universal Lighting System assures maximum flexibility at minimum cost. Check its many advantages. Consult your electrical contractor or BullDog field engineer. Or write BullDog Electric Products Co., Detroit 32, Michigan. © BEPCO



CROSS SECTION of new, low-cost 20-amp Universal Lighting System. Movable weight supports and twistout plugs speed rearrangement, addition or removal of fixtures, eliminate rewiring and electrical downtime.

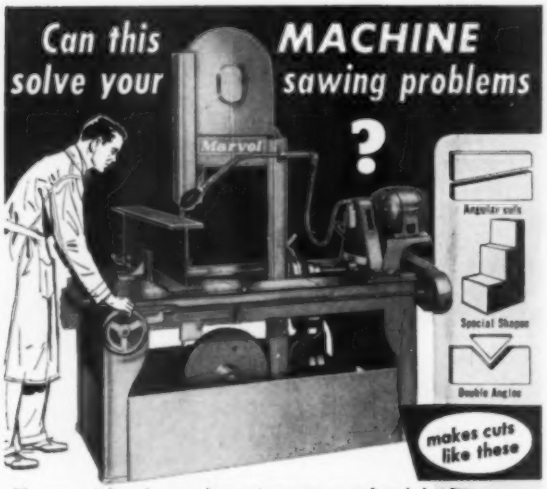
BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

HEAT BETTER ELECTRICALLY

CIRCLE 341 READER SERVICE CARD

Can this MACHINE solve your sawing problems ?



If your metal sawing requirements are many and varied . . . if you have to cut the smallest, most delicate work or heavy solids up to 18"x18" . . . if you cut-off bar stock, pipe, tubing, moulding or structural shapes—then this MARVEL No. 8 Band Saw is the machine for you.

Not only is the MARVEL No. 8 Band Saw a truly universal machine capable of handling virtually any metal sawing job, but it does its work with unmatched efficiency, economy, and ease of operation. Many exclusive No. 8 Band Saw design and operating features such as vertical column design, control tower visibility, column and blade tilting to any angle up to 45° right or left of vertical for cutting at an angle or miter, are described in Bulletin 875. Write for it today. If you'd like a demonstration, mention the fact in your inquiry, and we'll arrange it at your convenience.

ARMSTRONG-BLUM MFG. CO.
5700 West Bloomingdale Avenue, Chicago, U.S.A.

CIRCLE 342 READER SERVICE CARD

THINK of it!

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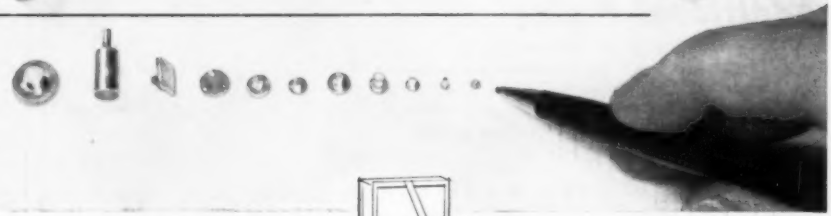

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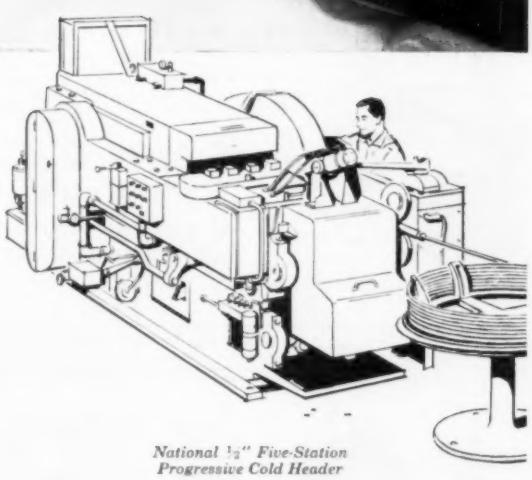

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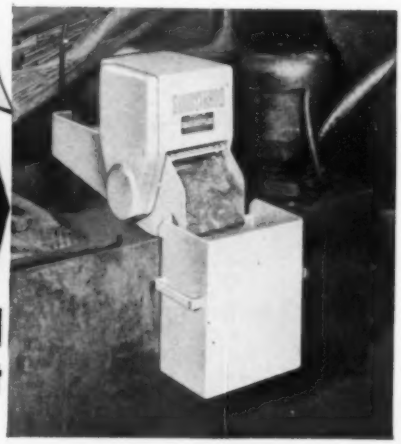

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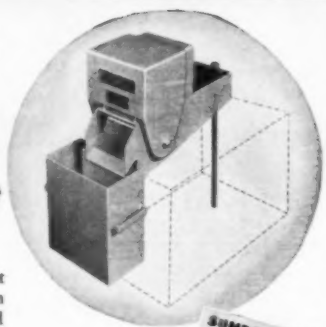

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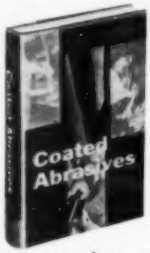

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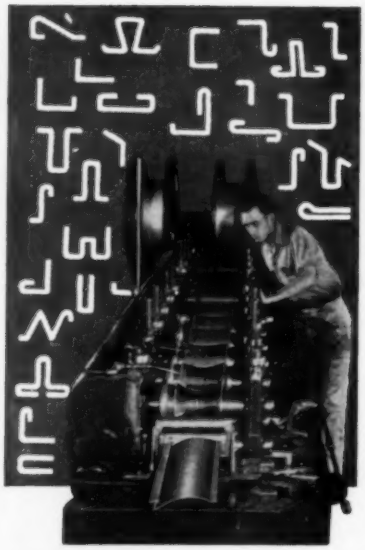

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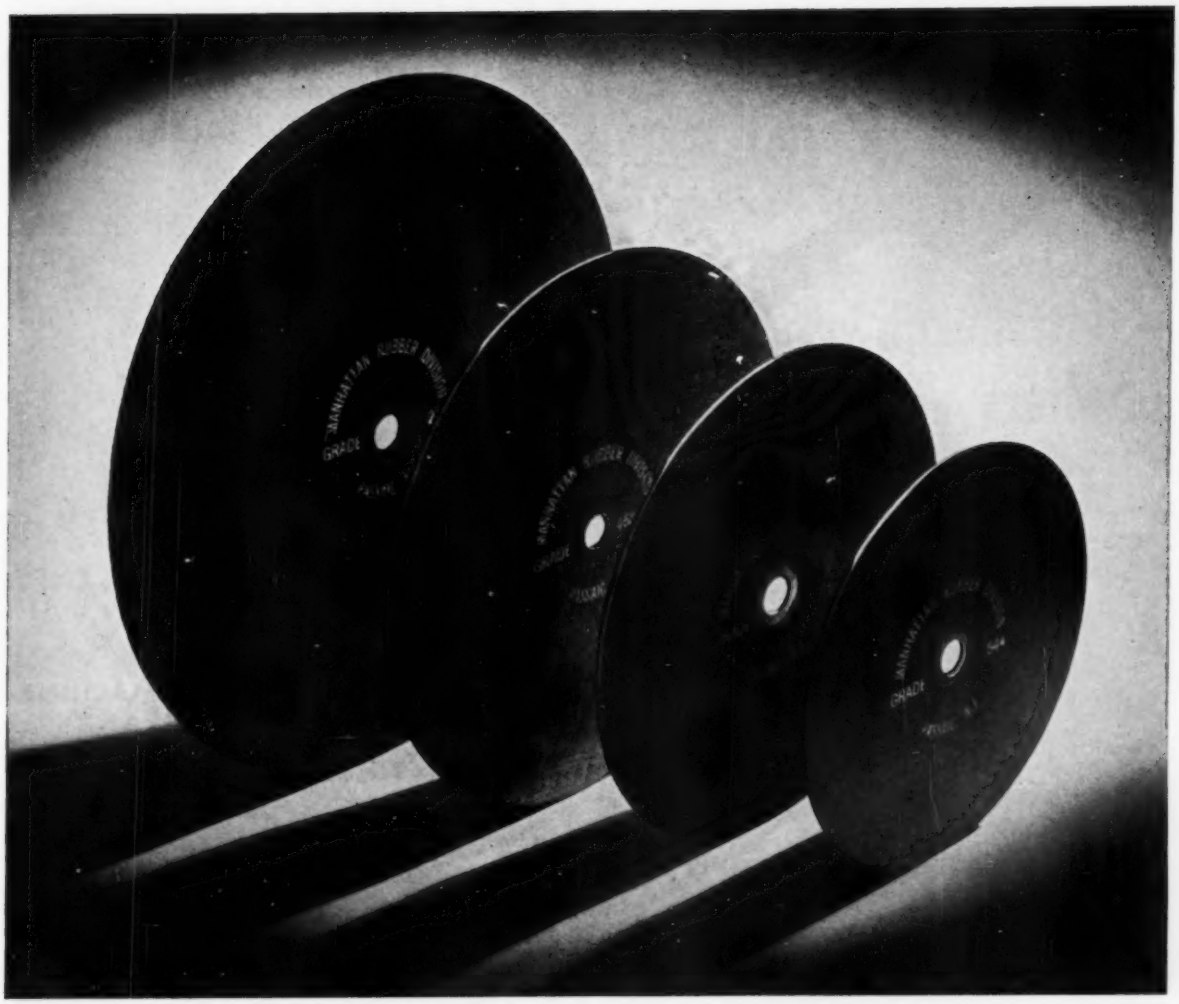

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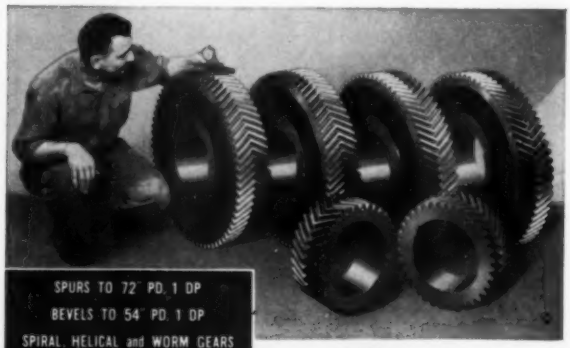

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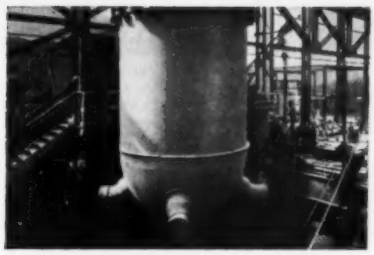

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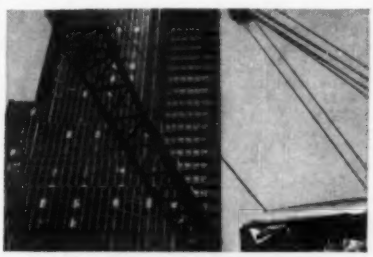

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3 million workers will benefit from new highway and construction programs—and even more workers will be needed soon.

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1. MORE PEOPLE—Four million babies yearly. U. S. population has *doubled* in last 50 years! And our prosperity curve has always followed our population curve.

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3. MORE INCOME—Family income after taxes is at an all-time high of $5300—is expected to pass $7000 by 1975.

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Add them up and you have the makings of another big upswing. Wise planners, builders and buyers will act *now* to get ready for it.

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MILLER. No. 36 VanNorman, ram type 1942
OIL GROOVER. Wilmoe Continuous, 1943
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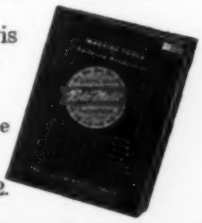

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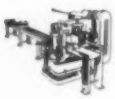

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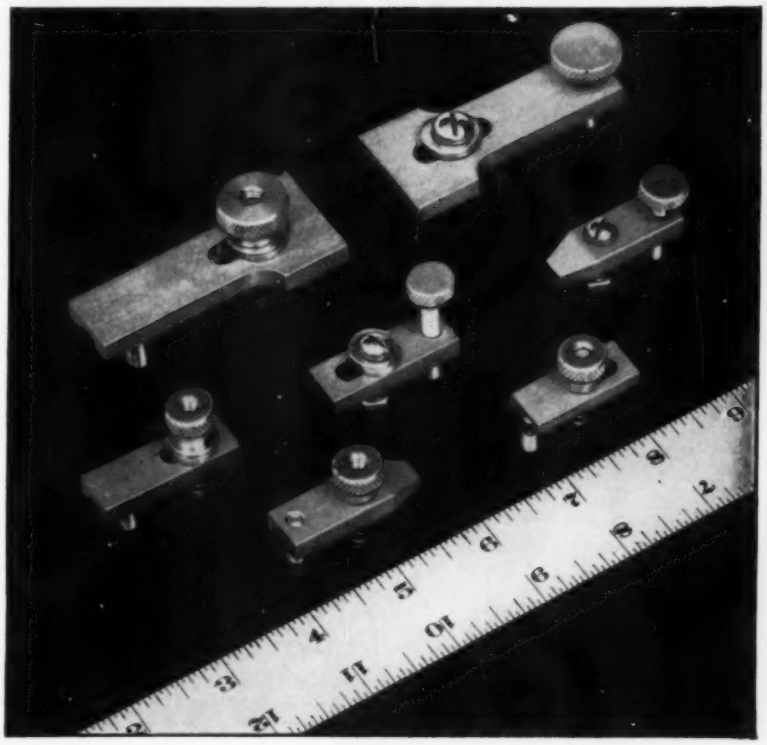

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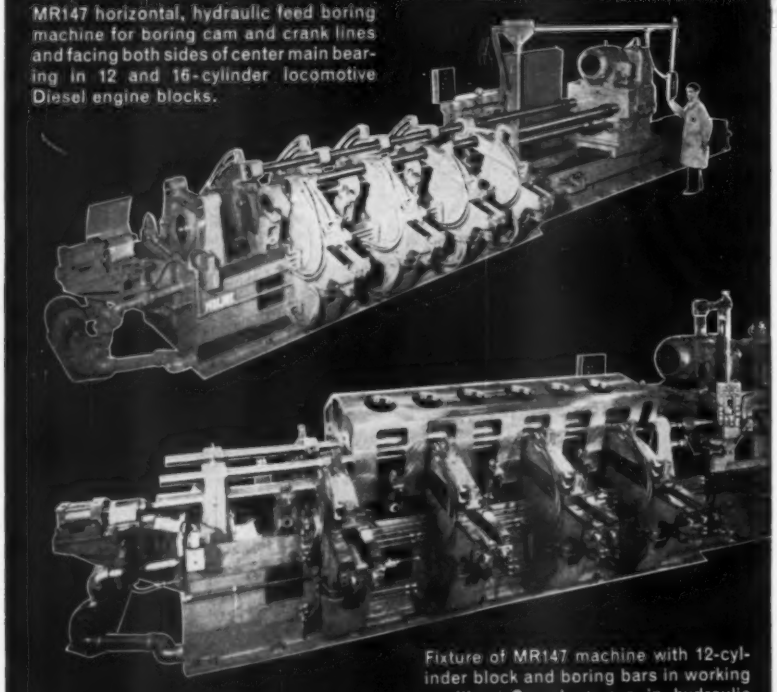

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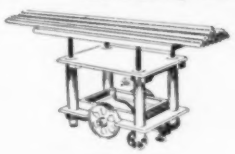

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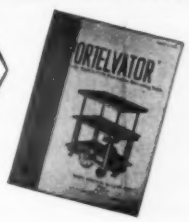

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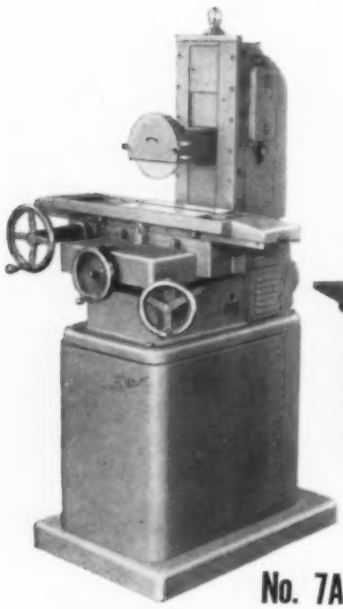

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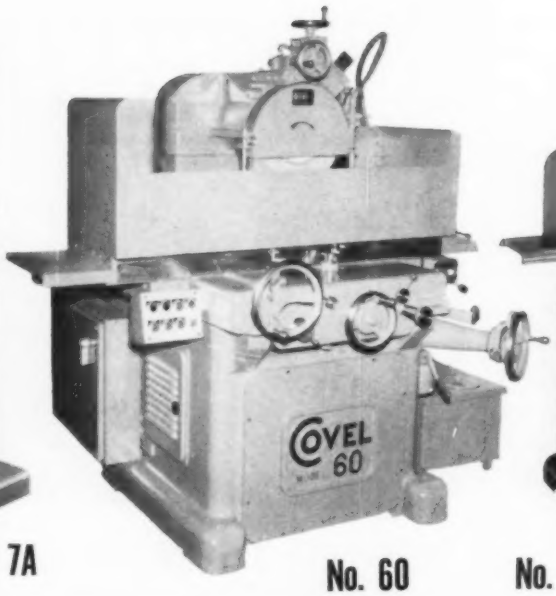

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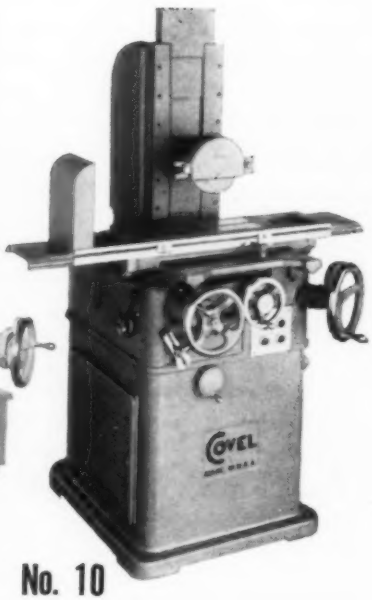

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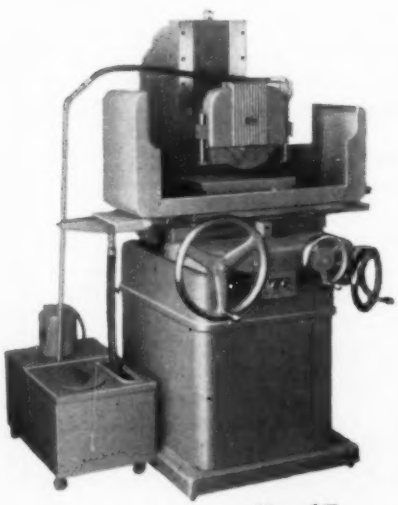

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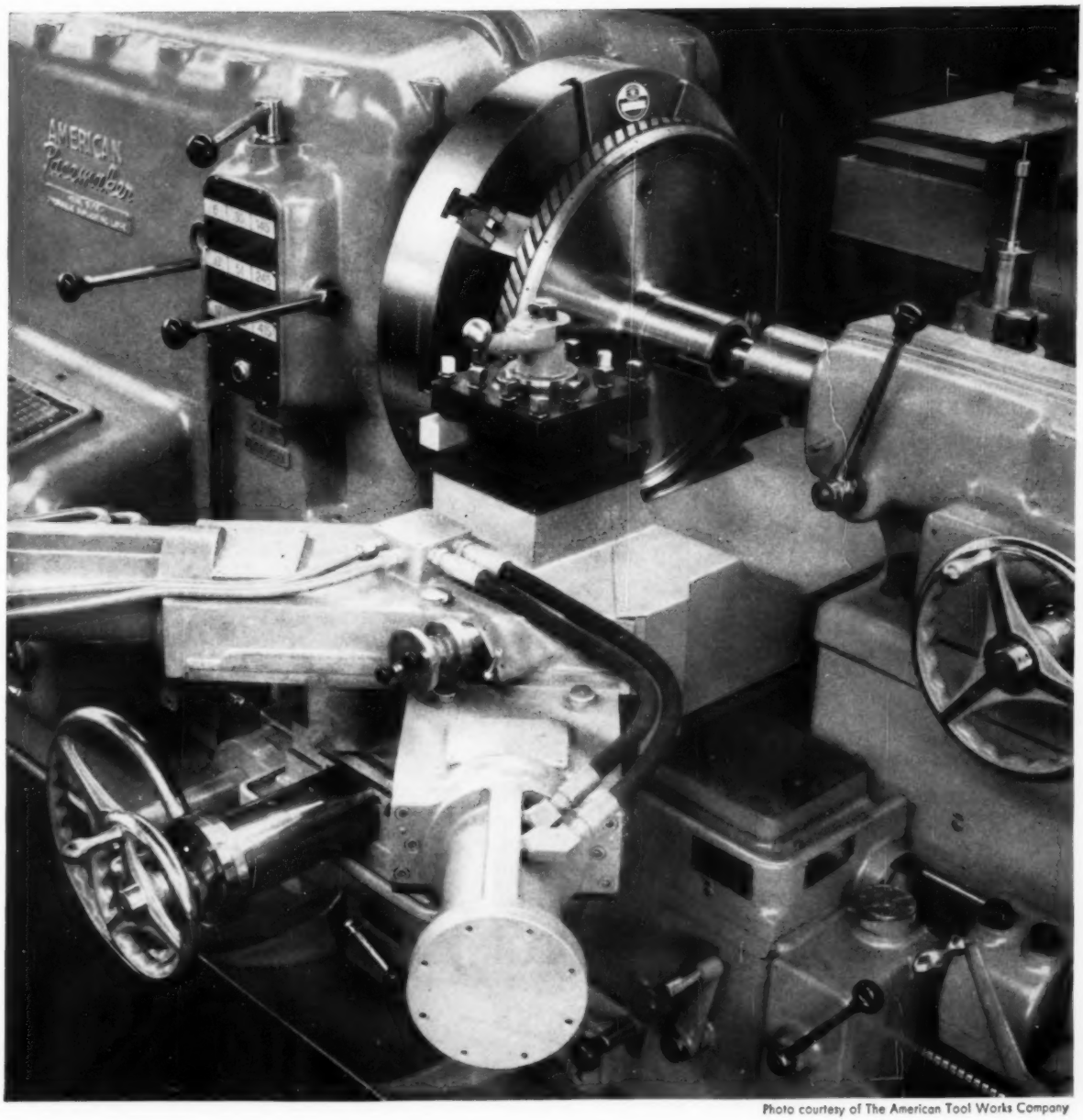

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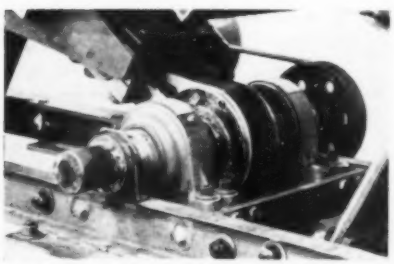
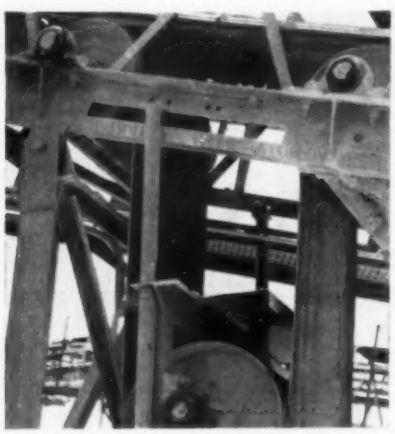
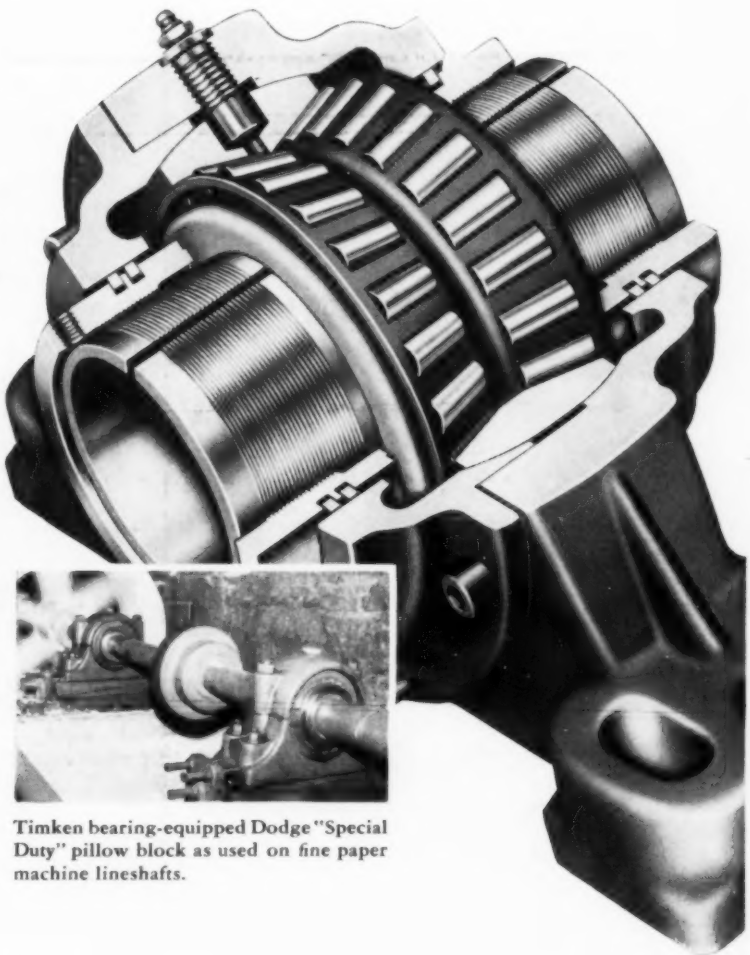


Timken bearing-equipped Dodge All-Steel pillow block used in a vibrating conveyor.



Timken bearing-equipped Dodge Type "E" pillow block used in sand and gravel plant.



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